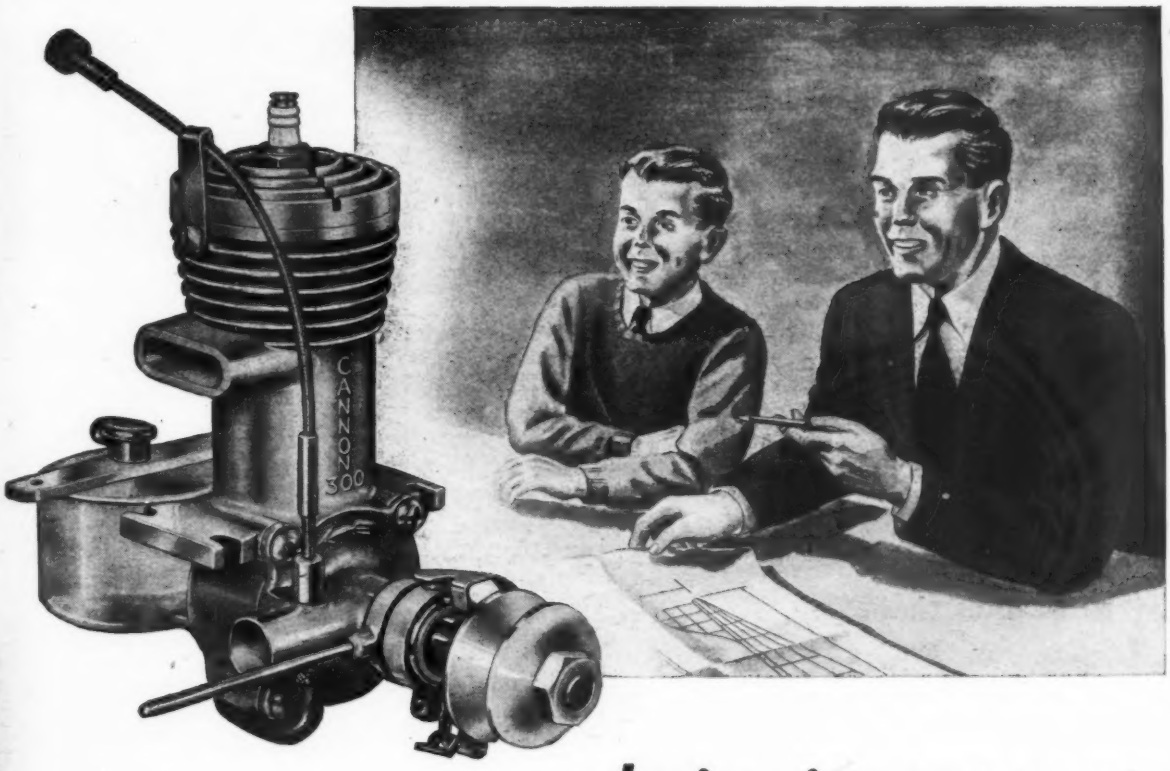
MODEL AIRPLANE NEWS

JULY 1946 · 20 CENTS
An AIR AGE Publication



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design improvements account for this performance

Our designers took into consideration many factors in designing the CANNON. Several features account for its performance and the approval that stands back of comments like this: "The CANNON motor is more than 'just amazing'. We have made extensive experiments in controlling an airplane (not control line) from the ground. The model plane we are using weighs just a fraction over four pounds and performs very well considering that we have loaded the plane with all the CANNON can take. Four pounds with a motor of such small displacement and at this elevation (5200 ft.) is certainly a record worthy of note."

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(For Class B)
.750 Bore; .678 Stroke.
Displacement .299 cu. in.; Wt. 6½ oz.; 5000 r. p. m. With 14" prop.
Complete with Plug, Coil and Condenser.
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Serving Aviation 18 Years

MODEL AIRPLANE NEWS

GEORGE C. JOHNSON, Publisher — JAY P. CLEVELAND, General Manager

JULY, 1946 — VOL. XXXV, No. 1

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AN AIR AGE PUBLICATION

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LAST OF THE four big wartime "secrets" has been released to the public: the 12 in. airborne rocket shell! Known as *Tiny Tim*, the monster carried the impact of a standard 12 in. battleship rifle and was in combat use during the closing weeks of the war in the Pacific. The giant rocket is 10 ft. long, weighs 1284 lbs. and mounts a 590 lb. semi-armor-piercing warhead. Its charge is 146 lbs. of ballustite which, although burning after ignition for only 2 seconds, sends *Tiny Tim* towards its target at a speed of 800 ft./sec. (faster than the speed of sound)! The rocket is mounted in fittings under the belly of a fighter plane and carried thus to the target area. After aiming, the pilot presses a trigger which releases the rocket in the same manner as a bomb. A cable is attached to the firing pin and, after falling out of line with the propeller arc, the rocket is ignited and speeds on its way.

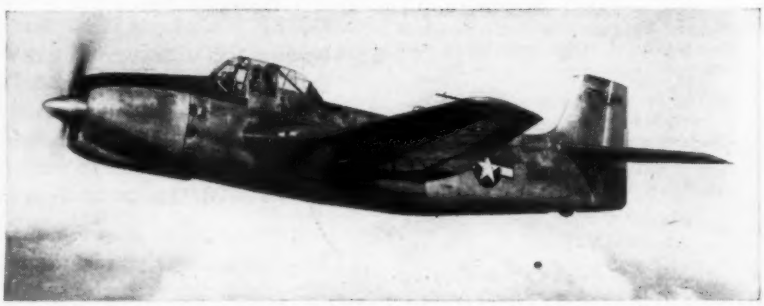
AN EQUALLY DEADLY airborne rocket is the *Holy Moses*, a supersonic weapon with a 5 in. shell in its nose. Although weighing only 140 lbs. and propelled by a 24 lb. ballustite charge, this rocket travels at the astounding speed of 2090 ft./sec., which obviously earned for it its picturesque name. It was first used in combat in July 1944.

THAT UNCLE SAM is pressing rocket research to the fullest is borne out by reports released from White Sands Proving Ground, near Las Cruces, N. M., operated by the Army Ordnance Department. Experiments with a needle-thin rocket known as the *WAC Corporal* resulted in altitudes as high as 120 miles being reached. The *WAC Corporal* is 1 ft. in diameter, 16 ft. long and weighs about 1,000 lbs. It was developed by the Jet Propulsion Laboratory of the Calif. Inst. of Tech. under direction of Dr. F. J. Malina. The rockets themselves were built by Douglas Aircraft Co. Although the rockets are fired vertically they come to earth 30 miles away, due to its rotation (about 1,000 mph).

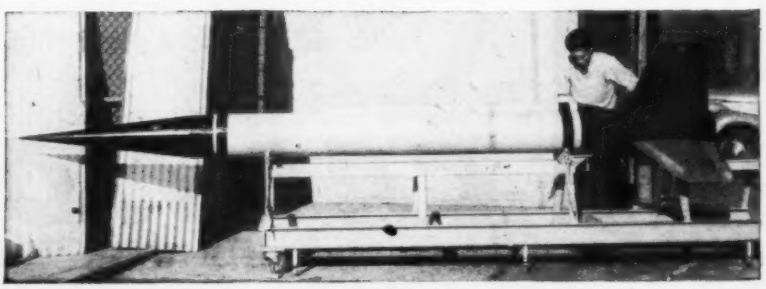
THESE TESTS ARE actually only preliminaries to the start of captured German V-2 firings expected momentarily. V-2 rocket motors have been tested at White Sands and the necessary operational technique established. Warheads, of course, have been removed from the test specimens. Object of this research is the development of American rocket-propelled guided missiles in preparation for the perfection of an atomic weapon virtually omnipotent in future warfare.

LATEST AAF HEAVY bomber is the Boeing XB-44 *Superfortress*, a version of the Japan-flattening B-29 but fitted with four Pratt & Whitney R-4360 *Wasp Major* engines. The new version, under flight tests since V-J Day, is a prototype of the B-50, now in quantity production at

(*Turn to page* 91)

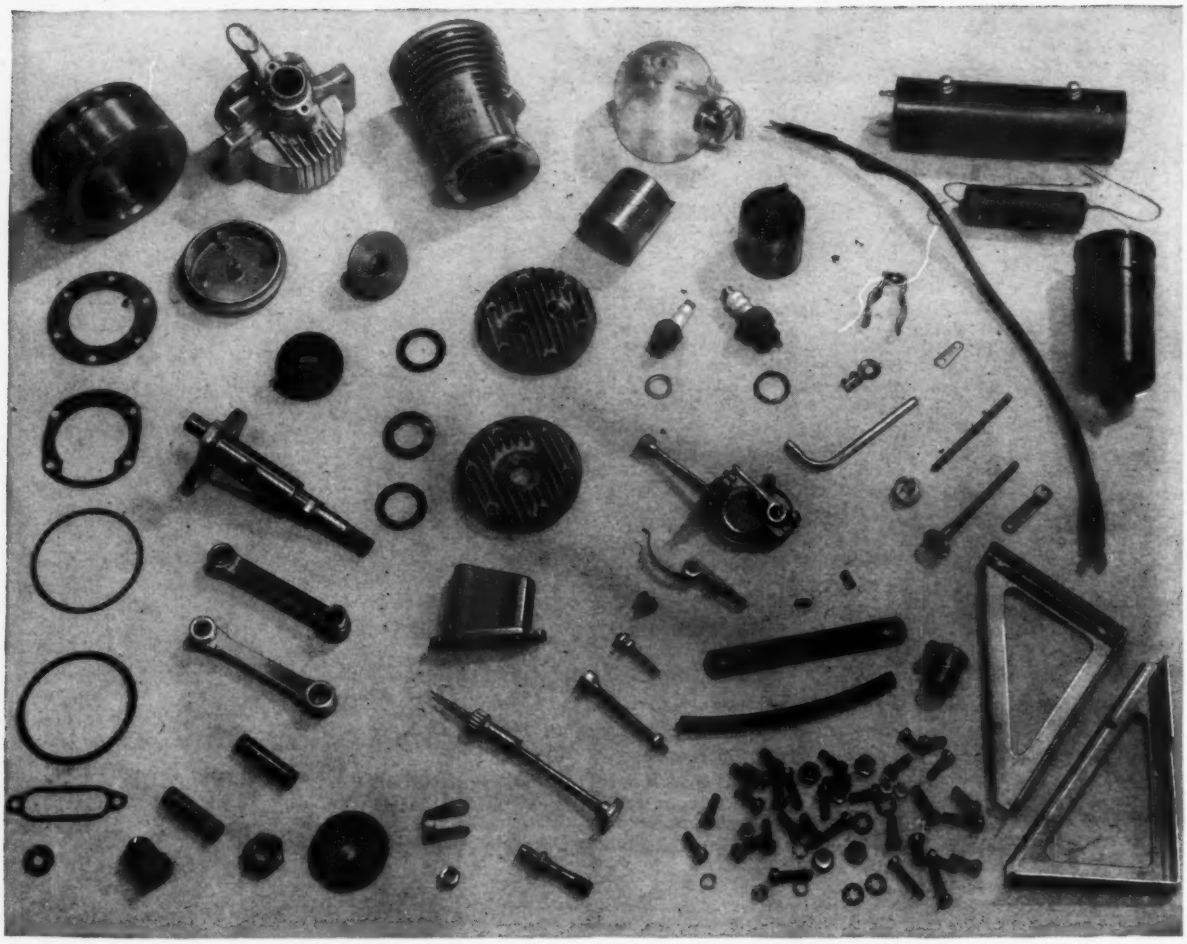


(Above) Consolidated Vultee XA-41, a close support type which was ready for production but not needed. P. & W. 3000 hp engine gave speed of 363 mph and ship could carry 6400 lbs. of bombs in addition to four 37 mm cannon and four .50 cal. guns. (Below) Needle-nosed WAC Corporal sounding rocket. Bulge on top houses a radio antenna



PARTS AVAILABLE

IN LIMITED QUANTITIES



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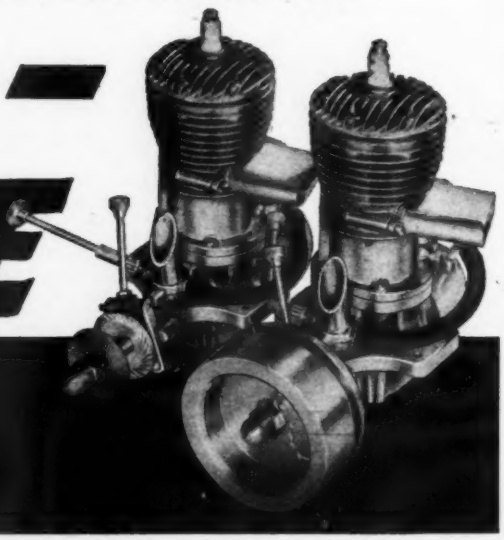

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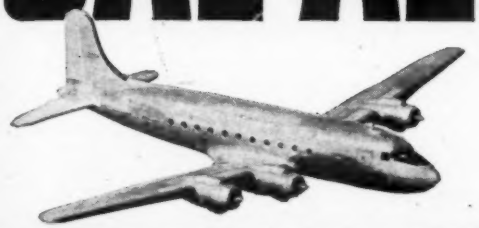

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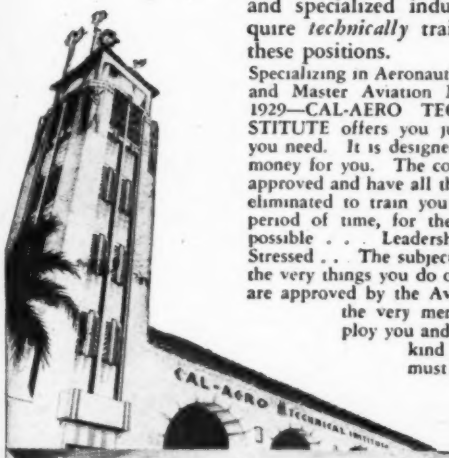

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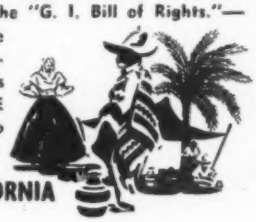
CAL-AERO Technical Institute is on the list of approved schools on file with the Veterans' Administration, making discharged service men attending CAL-AERO eligible for the educational benefits, as provided under the the "G. I. Bill of Rights."—Hundreds of ex-service men are now enrolling and attending, taking advantage of these benefits here at CAL-AERO. . . . WRITE US . . we will be happy to help you with your future plans.



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UNDER PERSONAL SUPERVISION OF MAJOR C. C. MOSELEY, PRESIDENT AND FOUNDER SINCE 1929...ON OUR OWN HUGE AIRPORT—IN HEART OF THE AIRCRAFT INDUSTRY

Model Airplane NEWSLETTER

by AL LEWIS

THE NUMBER of contests this year is going to break all records. And the awards offered will set new highs, too. For example, take the Alma, Kansas contest which will be held on August 10 and 11. Sponsored by the Palenche Post No. 32 of the American Legion, the meet is being directed by the post commander, Don Holcombe. Fifteen hundred dollars worth of cash and prizes is being offered.

Now this is only one meet, admittedly a large one, but there will be hundreds of competitions like this throughout the country this year. It all adds up to an expert's paradise. If he could only get to all the meets! We were asked to estimate the worth of all the awards which will be presented in 1946 and after some careful figuring and research work the sum of $250,000 seemed most conservative. Think of that! A quarter of a million dollars in awards! Model aviation sure has come a long way.

The annual "Flying Circus" in Philadelphia sponsored by the Philadelphia *Record* and the Retail Dealers' Association is to offer an Ercoupe as first prize this fall. If you hold a CAA license you could win the meet and fly home!

* * *

APPARENTLY some of the better organized clubs of experts are out to break every record in the book. But they're going to have a tough time of it since record attempts will be made in great numbers this season. To illustrate our contention: the *Chicago Aeronuts*, the windy city's famous club, have scheduled record trials indoors at the Rockwell-Madison armory on July 14, August 11, September 8, October 6, November 3 and December 8. They have outdoor record trials sanctioned for July 21, August 18, September 15 and October 13.

Up Hartford, Conn. way the *Model Aero League* under the direction of Frank B. Bushey will hold outdoor record trials on July 20, August 3, September 7 and 21, October 5 and 19. The *Dinuba (Calif.) Model Club* is another livewire organization out after new national marks. Also the *Schenectady (N.Y.) Aeroneers* are going after national records in a big way with two record-trial meets on the books. Another California outfit eyeing the record holders category is the *Fresno Gas Model Airplane Club*. They have record trials okayed for September 9.

It all adds up to quite a flying season. Bigger and better prizes and more and more records will be broken.

* * *

A CHAP wrote to us not long ago and his letter was so interesting we are taking the liberty of reproducing it in part here. It certainly shows that there are some individuals who recognize the importance of aeromodeling in America. At the time he contacted us the writer of the letter was a lieutenant colonel in the Air Corps stationed at AAF Training Command in Fort Worth, Tex. Here is what he had to say:

"The undersigned and two other servicemen, who have just been released from the Army Air Forces, are desirous of forming a model airplane club and of affiliating with the A.M.A. We three servicemen have formed our own company and are entering in the aviation field in the immediate future in the vicinity of Sherman, Tex. A flying school, maintenance shop, charter service and aircraft sales and service for several of the popular, postwar personal planes are included in the functions of our newly organized company.

"Our firm feels very strongly that the future of aviation in America lies in the proper education of our youth as to the value and necessity of aviation and its constant expansion. Therefore we are prepared to spend a portion of our time and efforts toward this end knowing that in the long run it will pay dividends to our community, our nation and our firm. It is our belief that a model airplane club is one of the best methods of educating youth on all phases of aviation."

That certainly is an excellent testimonial for model aviation. We agree 100%, of course, and know you do too. Oh, for 100,000 more enthusiasts like the colonel!

* * *

SPEAKING of backing for model aviation, several developments of late indicate that a lot more sponsorship for clubs and contests can be expected in the future. Inasmuch as details concerning the following items were given to us in confidence we cannot mention names. But take our word for it each concern in the picture is topnotch.

1. One of America's leading airlines is working on a plan to sponsor model clubs throughout the section of the country it serves, in cooperation with local department stores and newspapers.

2. One of America's largest newspapers, with a daily circulation of many hundreds of thousands, has

(*Turn to page* 70)

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Varsity B	3.50
Baby Play Boy	1.00
Playboy B	2.95
Playboy Senior	4.95
American Ace B-C	3.95
Musketeer Std.	4.95
Custom Cavalier 108	15.00
Buccaneer B Special	3.95
Roamer A-B	2.95
Silver Streak	15.50
Pacer B	3.95
Pacer C	4.95
Megow Wog	5.50
Megow Piper Cub	6.95
Megow Ranger	3.00
Megow Zombie	3.00
Megow Aero Champ	2.50
Banshee	6.95

Add 25c for Packing & Post.

U-CONTROL

Controliner	$ 5.95
Scientific-Cyclone	4.95
Whizzer	9.95
Falcon, all models	5.45
Miss Behave	3.95
Tiger Shark	4.95
Baby Miss Behave	1.65
Duralyt	14.95
Streamliner	4.98
Buzz	8.95
Duraplane	12.50
G-13	7.95
Baby V Shark	2.95
Super Shark	4.95
Dreamer	7.50
Sharpie	1.00
Teather Shark	3.50
Ercoupe	12.50
Cadet P-51	3.75
Cadet P-47	2.95
A-J Fireball	10.00
P. D. Q.	5.00
Eagle Scale-Liner	4.95
Piper Skycycle	7.50

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JET PROPULSION

Ray Racer	$1.25
Ray Jet Streak	.75
Ray Jet Wing	1.00
Ray Swisher	.50
Ray Lockhead P-80	1.50
Ray Super Rocket	1.00
Hotshot Jet Race Car	.50
Launching Gun	1.00
10 Rocket Units	1.00
Plungers	.15

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SOLIDS

Strombeck-Becker	$0.25 up
Cavacraft P-51	.50
Swing Control P-38 & P-40	1.75
Falcon	.50 up
Ray Ring	1.00
Wardie Jay Circus	1.50 up
Testor	1.00 up
Maircraft	.25 up
Cadet	.25 up
Eagle	.25 up
Red-Y-Cut	.40 up
Westcraft	2.50
Leddy Amphibian	2.50
Leddy Jeep	1.90
Cavacraft Piper Cub	.50
Maircraft	.35 up
Railway Express Trucks	6.95

Add 15c for Packing & Post.

RUBBER POWERED

Cleveland	$1.50 up
Megow	.25 up
Scientific	.35 up
Comet	.25 up
Capitol	.65 up
Berkeley	1.25 up
Eagle 4-1 Series	1.00
Modelcraft	.25 up
Ideal	3.50 up

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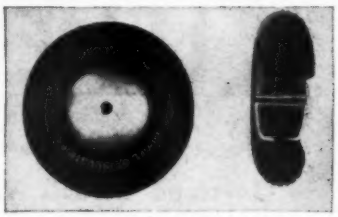
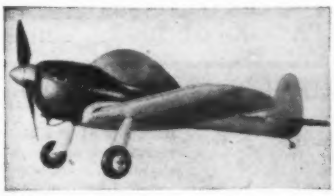


REAL AIR WHEELS

by Model Industries

$1.00 PAIR

Dress up those models with these realistic air wheels. Tread and size markings are just like the real thing. When you build a swell model, make it look still better with MI Air Wheels. Notice the cut-away view at the left.



PIPER SKYCYCLE

$7.50 less motor

Add 25c for postage

This baby (a Capitol Model) is patterned after its big brother recently brought out by Piper, the famous light plane designer. No collection is complete without the Skycycle. Buy it and fly it!

POPULAR ERCOUPE

$7.50 less motor

Add 25c for postage

This U-Control plane has a 40" wingspan and is a deluxe model. With the war over, fellows are turning to models of favorite civilian planes such as the Ercoupe. This is one of the most famous because it has eliminated the use of rudders and is certified spin-proof.

A Real Power House

The New ARDEN

Standard $19.50

Ball bearing $21.50

This baby packs the power! One of the newest motors. Precision machining and your choice of the standard or ball bearing model make this motor a giant among the midgets. Get an Arden and get ahead of the crowd.

Burgess Batteries!

Burgess 3-volt Booster Battery	$1.05
Burgess 3-volt Class B	.55
Burgess 3-volt Class C	.70
Burgess Connectors	.05
Burgess Penlite Batteries	2 for .15
Burgess Medium or Large	.10

TOPPING "100"

$10.00 less motor

Add 25c for postage

Built for one reason: TO FLY! Made of pre-formed aluminum, all you do is install your B or C motor, snap it together and "let 'er go."

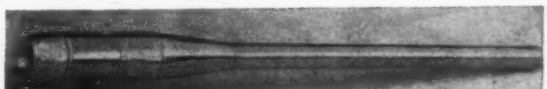
OTHER ACCESSORIES

Champion Spark Plugs, all sizes	$ .50	Wood Motor Mounts Class A-B (3/8" x 1/2" x 12")	
2" Sponge Rub. Wheels, pr.	.40	2 for	.10
Areo Coil	2.50	Class C (7/16" x 5/8" x 12")	
Areo Coil, Super	3.00	2 for	.10
25'—1/8" Flat Rubber	.50	X - Cell Props, 9", 10", 11"	.75
Neoprene Tubing, 1 foot	.35	Tether Control Hinges, New Type (4")	.25
Alligator Clips 2 for	.15	Smith Fire Cracker Coil	2.75
Burgess Vibro Tool	7.50	High Tension Leads	.20
Burgess Vibro Tool Kit	16.50	Small Metal Condenser	.50
Rubber Tail Wheel, Aluminum Center	.10	Hook-up Wire, 10'	.50
Baker Gadget, Unit for Converting G-line to U-control	.25	12 Solderless Lugs	.25
		Special Pliers for Lugs, pair	3.75

A Real JET *Engine!*

$35.00

Add 25c for Packing & Post.



This MINIJET engine is the real thing, modeled after the famous V-1 Buzz Bomb engine. The Minijet is 27" long and 2" in dia. Weighs 16 oz. Burns gasoline—2 oz. per minute. Develops more than 2 lb. thrust. It can be used as the fuselage with surfaces attached directly to the engine's body.

HOBBIESTS: If the particular model or accessories, camera supplies or drawing equipment is not listed here, write us your needs, or see our nearest dealer. You'll get prompt attention from Tuthill's . . . the house of friendly service.

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Minijet	35.00
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No C. O. D.'s on engines

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Metal Motor Mounts, Large	.45
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Red-I-Mix, 1/2 pint	.30
Red-I-Mix, 1 pint	.50
Silkspan, G. M., 3 for	.25
Silkspan, R. P., 6 for	.25
Exhaust Stacks, Ohlsson & Bantam	0.35
Berryloid Dopes and Thinners	
1 1/4 ounce	.15
2 ounces	.25
1/2 pint	.40
1 pint	1.10
Burgess Batteries—all sizes.	

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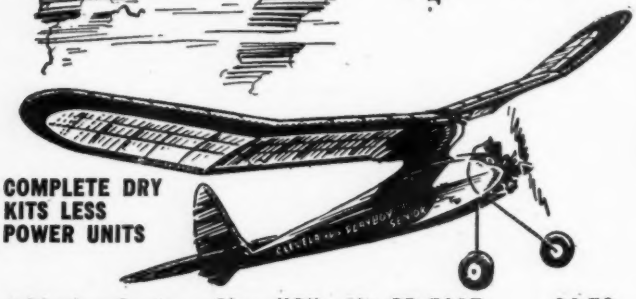
IN THE GOOD OLD SUMMER TIME



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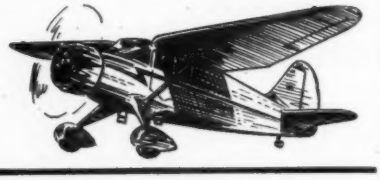
Back again! The big 82½" gas-powered model, redesigned and greatly improved—now much simpler to build with many pre-fabricated parts supplied. Employs most any engine. Dry kit (no liquids) Kit GP-66b— only $15.00



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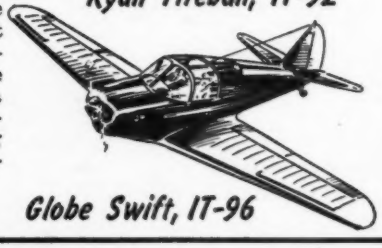
Stinson 150, IT-98

Lockheed's Shooting Star, IT-90

Four New Beauties!

With exceptional flight characteristics designed right into them for competition in contest flying, they are strong and fly most realistically. With less detail than the MFM series, these models employ the simplest possible methods of construction, enabling even the novice model builder to turn out a tip-top job, although the expert, too, will enjoy building and flying them. All are complete dry kits.

Ryan Fireball, IT-92



Globe Swift, IT-96

GIANT SOARING GLIDERS

7 Ft. CONDOR, Kit E-5019—$1.00

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4 FT. EAGLET, KIT E-5018—50c

★ When You Build **CLEVELAND MODELS** You're Building Models That Pilots, Instructors, Cadets-in-Training and Mechanics in the Air Forces Build CONSTANTLY ★

CLEVELAND MFM (MASTER FLYING MODEL) MODEL KITS

THE WORLD'S FINEST, MOST AUTHENTIC, AND COMPLETE KITS

In designing these MFM (¾" to 1') kits, the aim has been to produce the World's finest model aircraft. All are super-detailed models, carefully engineered and incorporate all external detail of the full sized plane we can incorporate. To simplify assembly, the C-D originated half-shell method of construction is used (this closely follows full-sized aircraft construction methods). The wealth of authentic detail on a completed C-D model is easily made, because all drawings are engineered to aid you in building all parts to true scale.

North American B-25 "Mitchell," Famous Tokyo Raider—Kit SF-125.....$8.50
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Mitsubishi 00 "Zero," Jap Fighter—SF-86.....$3.00

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These Kits Are Discontinued—But

your dealer may still have them in stock — see him!

WE NO LONGER HAVE THEM AT OUR FACTORY!

Curtiss SBC "Helldiver," Dive Bomber—SF-80.....$3.50

Junkers JU87 "Stuka," Dive Bomber—SF-84.....$3.00

Grumman "Wildcat," Carrier Fighter—SF-83...$3.00

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Each Kit only $1.50

PIPER CLUB T-94

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LEARN ABOUT THEORY, DESIGN, CONSTRUCTION, FLIGHT, by building and flying the complete CLEVELAND line of fine models—a line of model kits to suit everyone, from beginners to experts. By building the complete line, you will really get a thorough ground course in the basic principles of aviation, theory, design, construction and flight.

WHEN YOU ORDER: See your dealer first! If you are then unable to get C-D's do not accept substitutes but order direct, and include 20c for packing-postage. Minimum order $1.00. No C.O.D.'s. Special Delivery, 25c extra (U.S. only). Ohio residents: add 3% Sales Tax. Men in Armed Services may now order any CLEVELAND kit—except B-17 Bomber which is too large for shipment. Add 10% for necessary handling and postage charges as usual when stationed outside continental U.S. All kit contents and prices subject to change and cancellation without notice.

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CATALOG 5c
(Free list at your dealers)

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Clip and fill out this coupon and take it to your favorite hobby dealer. If he does not have these kits in stock, ask him to order them for you, giving him this coupon as a reminder to get them for you promptly. Do not accept substitutes for CLEVELAND kits.

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WEST COAST TIPS

By JOHNNY DAVIS

THIS month we would like to point out a few new noteworthy items of manufacture. It seems as if somebody is answering the call of all model builders for more value and better designing in the manufacture of articles that definitely must be used by the poor, long suffering model builder.

For example, there's a new coil which shows the trend toward better designing and value. Under test the coil shows a drain of only 3 amperes when points are closed, a definite step in the right direction.

The same manufacturer is also coming out with a plug-in type cap on their battery which will make it virtually leakproof. This will be one battery that you won't be able to shake the acid out of.

Another important item especially for you fans of speed controlled racing is a new line of propellers now in production. These props check true-pitch from hub to tip, as well as having a nice finish and efficient design. You will be seeing them in model shops soon.

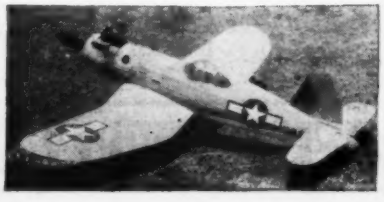
Last night we journeyed out to Pacific Palisades to see our old friend Louis Casale. "Louie" is probably known to most "National" fans as he used to win the National Scale Model Championship as inevitably as taxes. In the course of conversation, we asked what had ever happened to his scale model Waco taper wing that was three-time scale model winner in '36, '37 & '38. We knew that the Smithsonian Institute had several times asked him to let them have it and we wondered what he had ever done with the model. To make a long story short Louie turned down the Institute and let a man use it to show to scout troops and hobby clubs. Finally, Louie got it back and became curious as to how he had made some of the parts. One thing led to another and soon he had all the covering stripped off it. Finally this beautiful model—so complete that the brakes in the cockpit worked on the wheels and the throttle worked the carburetor in the motor, and valued at approximately $7500—was carefully placed on the floor and jumped up and down on, so help me hanna. Two years work all shot to you-know-where.

E. D. "Hoppy" Hopkins (left), holder of World's Record Class C Speed 123.45 mph, and Frank Greene, pilot of plane. All trophies in this photo were won by this combination of plane pilot and owner (mechanic)

Nowadays Louie is the guiding genius behind the manufacturer of a beautiful control line model which is constructed out of aluminum. We have seen the prototype model and it is certainly one of the most beautiful we have ever laid our eyes on. The model made its maiden appearance at the Lockheed U-Control Contest, April 14th, and also was displayed at the Santa Monica Junior Chamber of Commerce contest May 9th. With few modifications it is either a U-Control model (precision or scale) or it can be

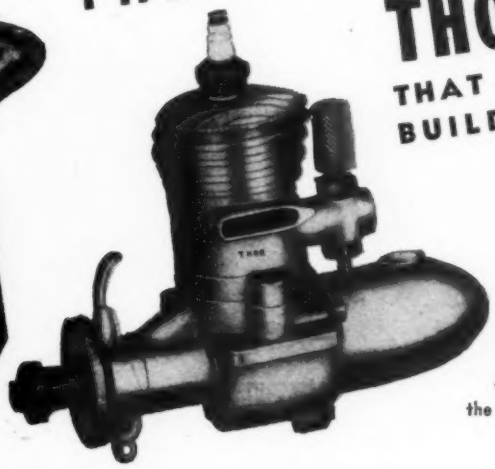
(*Turn to page* 70)

This F4U Corsair has won many trophies for its builder, Art Cummings of Glendale. The workmanship throughout is excellent; the canopy is especially notable for its neatness as this is where many modelers fall down



THE MIGHTY, NEW THOR "B" THAT YOU HELPED BUILD IS HERE.

FACTORY TESTED
READY TO RUN
ONLY $9.95
Complete with coil, condenser and fully illustrated instructions.



Yes—thousands of you modelers helped us build this wonderful new THOR "B." And now, here it is, with these unusual features which you said you wanted in the "perfect" model engine:

- Presto Starting Device
- Longer Crank Shaft
- Better Fuel Control
- Improved Cam and Timer
- Wear-Proof Rod

TESTIMONIALS

"I am an owner of one of your Thor engines. I think it is a good engine and have gotten many successful flights out of it. The last one was a 2½ mile, 1 hour 50 min. flight which was beautiful."
B. E., Midland, Texas.

"I also want you to know I am very pleased with the Thor engine I recently ordered from you. I'm amazed by the compression that is found in a motor as inexpensive as yours."
S. W., Ann Arbor, Mich.

"I received my Thor engine and am very much pleased with it."
F. G., Clinton, Ohio.

"I have really enjoyed my Thor since I have had it."
E. W., Orlando, Fla.

"Have received my Thor engine and am well pleased with it."
E. C., Norfolk, Va.

"I am really surprised and pleased with my Thor engine. It is really of fine workmanship and materials."
D. J., Sanford, Fla.

"A friend of mine received a motor from you the other day and it runs perfect. Please send me one right away."
R. C., Vestal, N.Y.

"I like the engine very well and it runs good."
S. S., Nashville, Tenn.

"I have gotten very satisfactory performance from your Thor."
G. B., San Rafael, Calif.

"I like the even and steady way it runs much better than several other motors I have owned. It also seems to have plenty of scup for its size."
E. L., Warm Springs, Mont.

"We are in receipt of the two Thor engines we ordered from you recently and are very well pleased with this motor and are enclosing our check for 4 more of these engines."
S. S., Pampa, Texas.

"I am a pleased and satisfied owner of one of your Thor gasoline engines."
S. W., Rutledge, Pa.

"After seeing one of the Thor engines run which was owned by one of my buddies, I reached a conclusion that it was a superior engine for the listed price."
W. F., Del. Co., Pa.

"I am a proud owner of your Thor engine and it runs with clockwork precision."
A. L., Long Beach, N.Y.

"The first ½ dozen were great so now ship me with haste 4 dozen more."
H. H., Omaha, Nebr.

"I am very pleased with my Thor engine."
B. R., Middlesboro, Ky.

"I am very pleased with your engine and hope to have it in a contest in the near future."
A. L., Long Beach, N.Y.

"Have had this engine for about one week now and am having excellent results with it."
O. W., Gulfport, Miss.

"Recently I purchased one of your 1/6 H.P. engines for use in a model plane. It is a perfectly good engine and I'm sure I never saw another one-cylinder job run so smoothly. I should know a little about it since I have been working on aircraft engines for the last five years."
M. C., Elmira, N.Y.

THOR—The Engine that won't be beat in any price field.

The Ideal Engine for all models, including boats and race cars!

Just a "twist of the wrist," and she's off—smooth, velveted power. Never lets you down!

This is your engine — powerful, smooth, streamlined. Featuring the newest technical developments in the model engine field. Just a "twist of the wrist" and she roars into action. It's as simple as all that!

THOR "B"

The mighty Engine that spells P-O-W-E-R

SPECIFICATIONS

H.P.: 1/6	Displacement: .29
Bore: 13/16	R.P.M.: 300-11,000
Stroke: 9/16	Weight: 4½ oz.

Class B, NAA RULES

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PLUS THESE EXTRA ADVANTAGES:

- Ideal for free-flight, U-Control planes, boats and midget cars
- Complete instruction book fully illustrated
- Full 30 day guaranty against defective parts
- Easy to start, "a twist of the wrist"
- Steady and consistent running
- High compression ratio for instant starting
- Every part precision engineered to perfection
- Lowest weight of all "B" engines without sacrifice of power
- Streamlined for cooler and longer operation
- New intake design for non-flooding and positive adjustment
- Piston, cylinder and bearing surfaces micro-precision fitted to .0001"
- Crankshaft of polished-ground steel, scientifically balanced
- Special oil grooves for longer life
- 1" bearing surface with forced double lubrication for longer wear
- Uniflow piston
- Integral all-metal tank
- Castings made of new "THOR" alloy. With more heat dissipation and wearing quality than any other engine
- Perma-designed foolproof timer—never needs adjustment—can't slip in operation
- Replacement parts available and interchangeable

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IMMEDIATE SHIPMENT

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Complete with coil, condenser and fully illustrated instructions.

SPECIFICATIONS

4 Part 2 Stroke Cycle—
¾" Stroke—
15/16" Bore—
300-7000 R.P.M.—
Bearing Surface, 1¼" Long—
Crankshaft, 5/16" Diam.
Motor Weight, 10 oz.—
Rotation, Either Direction
Invertible—
Runs on 2 Flashlight Cells—
Runs 27 Minutes on One Ounce of Fuel
Height, 4½"—
Width, 2½"—
H.P. Approx. 1/5th—
Displacement, .517 cubic inches
Class "C" under N.A.A. Rules

EXCEPTIONAL ENGINE VALUE WITH THE IDEAL ENGINE FOR ALL MODELS!

Imagine—operating your own G.H.Q. 1/5 Horsepower gasoline engine—tiny enough to put in the palm of your hand—yet turning up over 7000 rpm and powerful enough to fly model airplanes of from 5 to 10 foot wingspan.

Here is a scientifically constructed mechanical marvel that will thrill you with thousands of pleasure-packed hours. Get the real kick that goes with controlling the powerhouse that is your engine with just a finger tip.

Tested and proven over a span of 10 years. Yes, over 100,000 of these powerful G.H.Q. engines are in actual daily use. There is a reason for it! Why not join the ranks of this great fraternity of hobbyists?

These features make the G.H.Q. Gas Engine a Winner!

1. Easy starting.
2. Steady running—as long as gas, oil and spark are supplied.
3. Motor starts and runs on two flashlight cells.
4. Mottor cannot overheat.
5. Piston and cylinder features: piston constructed on one piece, with uniflow battle and high compression head, centerless ground to within .0002". Cylinder is selected grey iron for long life, Hutto-honed to within .0001" of absolute roundness. Piston and Cylinder are hand fitted to insure perfect compression.
6. Accurate long wear aluminum die castings for cylinder head, crankcase, etc.
7. One-piece drop-forged chrome-nickel steel shaft, perfectly balanced and centerless ground. Absolutely unbreakable.
8. Main bearing (1¼" long) is reamed and lapped to perfect fit.
9. Connecting rod of high-speed bronze.
10. Carburetor is accurately designed—extremely simple to operate.
11. Timer assembly compact, tool-proof, long-wearing, replaceable and adjustable. Genuine tungsten points. Not a cheap "wipe" timer but a real aviation type "make and break" system.
12. Coil will not overheat or short circuit; convenient terminals make soldering unnecessary; oil, gas, and water-proof; not a pee-wee—but a husky, yet lightweight, spark coil that will give a maximum spark.
13. Condenser is gas, oil and water-proof.
14. Champion "V" Spark Plug and Washer.
15. Easily inverted and runs in either direction.
16. Absolutely safe—impossible to explode.
17. Speed range 300 to 7000 R.P.M.
18. Low gas consumption—runs 27 minutes on one ounce of fuel.
19. Strongest miniature motor.
20. ALL PARTS REPLACEABLE.
21. Simple, illustrated and fully detailed operating instructions.

READ WHAT G.H.Q. ENGINE OWNERS SAY

R. D. COTTATI, CAL.: About one year ago I purchased one of your G.H.Q. Motors. I am glad to tell you that the G.H.Q. motor is a very fine motor. I have been using it in a Super G Shark. In the past year we have been having many model airplane contests and I have won nearly every one with my Super G Shark powered by your G.H.Q. motor. My G.H.Q. motor has been giving me excellent service.
J. N., BRECKENRIDGE, MINN.: Am having good results from my motor.
E. D., PLEASANT HILL, MO.: Received my G.H.Q. motor in fine shape. Very well satisfied, and think it is a swell little motor, runs fine. A friend of mine wants one, too, so wanted me to order it for him.
C. C., SOUTH HILL, VA.: I bought a G.H.Q. engine from you last September and installed it in a six foot wingspan airplane. In engine performance, the engine you sold me passed with flying colors. I congratulate you on putting so much performance in my engine at so low a cost.
G. F., PITTSBURGH, PA.: My G.H.Q. engine has given very satisfactory service for several years now.
E. S. J., TALLAHASSEE, FLA.: I have a G.H.Q. engine that I purchased from your company a short while ago and it operates satisfactorily.
N. L. B., N.Y.C.: I received my G.H.Q. motor in fine shape. It runs swell, and I am sending another order to you.
M. B. N., OMAHA, NEB.: I think the G.H.Q. motor is the best motor I have ever seen.
A. Z., TEXARKANA, TEX.: I have had about seven of your motors in the past and think quite a lot about them.
B. D. J., SAN FRANCISCO, CAL.: I already own one of your G.H.Q. engines and it performs like new.
R. D., GLEN ALLEN, VA.: I started it with only a few turns of the propeller and was very pleased with it.
J. M., ARLINGTON, VA.: I've had one of your motors for about three years now and it's still going strong.
C. C. N., AMARILLO, TEX.: Before my induction into the Army I built a few models which incorporated your G.H.Q. motor. I found it satisfactory and put a great deal of faith into it because of its dependability.
D. R., JR., LITCHFIELD, CONN.: I purchased one of your engines a few years ago and it is still in working order. I have used it in boat models with great success. I am particularly impressed by its easy-starting qualities. These are very valuable in a boat, where it is more difficult to start an engine. Usually, only one attempt is needed once the engine has been primed. As a matter of fact, my G.H.Q. motor starts easier now than when I bought it. The motor has satisfied me very much.
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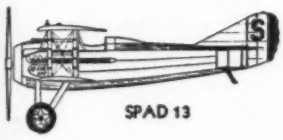
...FROM 1914 ...TO 1946

With Maircraft One Quarter Inch Scale "Trailblazers"



WORLD WAR I (1914 to 1918)

The Wright Brothers' crude plane bumped to its first landing at Kittyhawk, North Carolina in 1903.

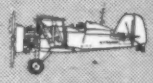
Twelve years later in World War I Spads, Nieuports and Camels prowled the skies of Europe in search of enemy Fokkers.

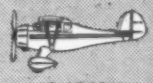
A Spad 13 flew to everlasting fame with a young pilot named Captain Eddie Rickenbacker and together they compiled an official record of 26 victories.

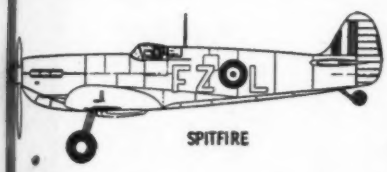
TRANSITION PERIOD (1918 to 1939)

Peace brought great strides in aviation. In 1924 Byrd crossed the North Pole and Lindbergh conquered the Atlantic in 1927 . . . the U. S. Air Corps expanded with Boeing and Curtiss Hawk and Goshawk fighters.

With the outburst of Civil War Spanish skies became a testing arena for the warplanes of Russia, Italy and Germany. The Russian Mosca saw spectacular action with the Republican Airforce.



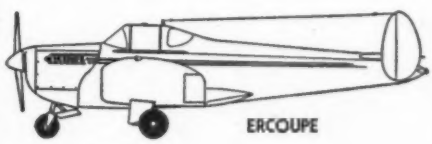




WORLD WAR II (1939 to 1945)

In 1939-40 the German Luftwaffe, paced by Heinkels and Messerschmitts, roared over the Balkans . . . then France. The Spitfire stood valiantly between Britain and defeat holding mastery of the sky against the winged fury of the enemy. Among many others, Bell Airacobras from throbbing American factories entered the conflict.

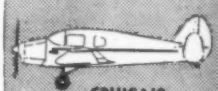
Far across the world P-40 "Flying Tigers" blasted Jap Zeros high above the mountains of ancient China.

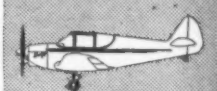


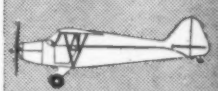
POST WAR (1945 to)

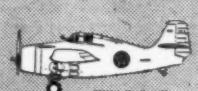
With the War behind it Aviation is ready to play its most spectacular role. Personal planes — Cubs, Taylorcrafts, and Swifts, are sold in Department Stores . . . Cruisairs carry sportsmen to remote hunting and fishing grounds . . . The spinproof Ercoupe almost flies itself . . . THIS is the exciting World of the Air!

MAIRCRAFT KEEPS PACE WITH AVIATION HISTORY WITH THE LARGEST SELECTION OF SOLID MODELS EVER OFFERED!









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Brown "C"	16.50	Atwood "C"	23.50
O'K Super 60 C	21.00	Rocket "C"	22.50
Roger's 29 B	15.75	Bantam 19 "A"	16.50
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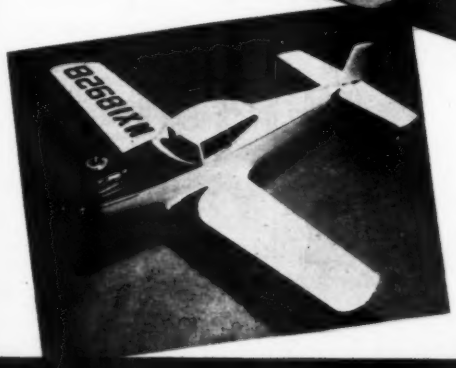
PLANE ON THE COVER MODEL

Model Navion

A beautiful model of an ultra-new private plane with construction of the simplest to aid the inexperienced

by FRANK EHLING



SCALE fans will be pleased with this little ship for she flies as well as she looks, yet there isn't as much work that goes with it as there is with the usual scale model. The engine was installed upright mainly to make the job simple; however, it can be inverted to further the scale effect. The tricycle gear is a real help as it surely reduces the prop bill. Using heavy sheet balsa fuselage sides with blocks to round out the design, and a planked wing, gives this model an all metal appearance when finished, and a good job will result if a little care is taken.

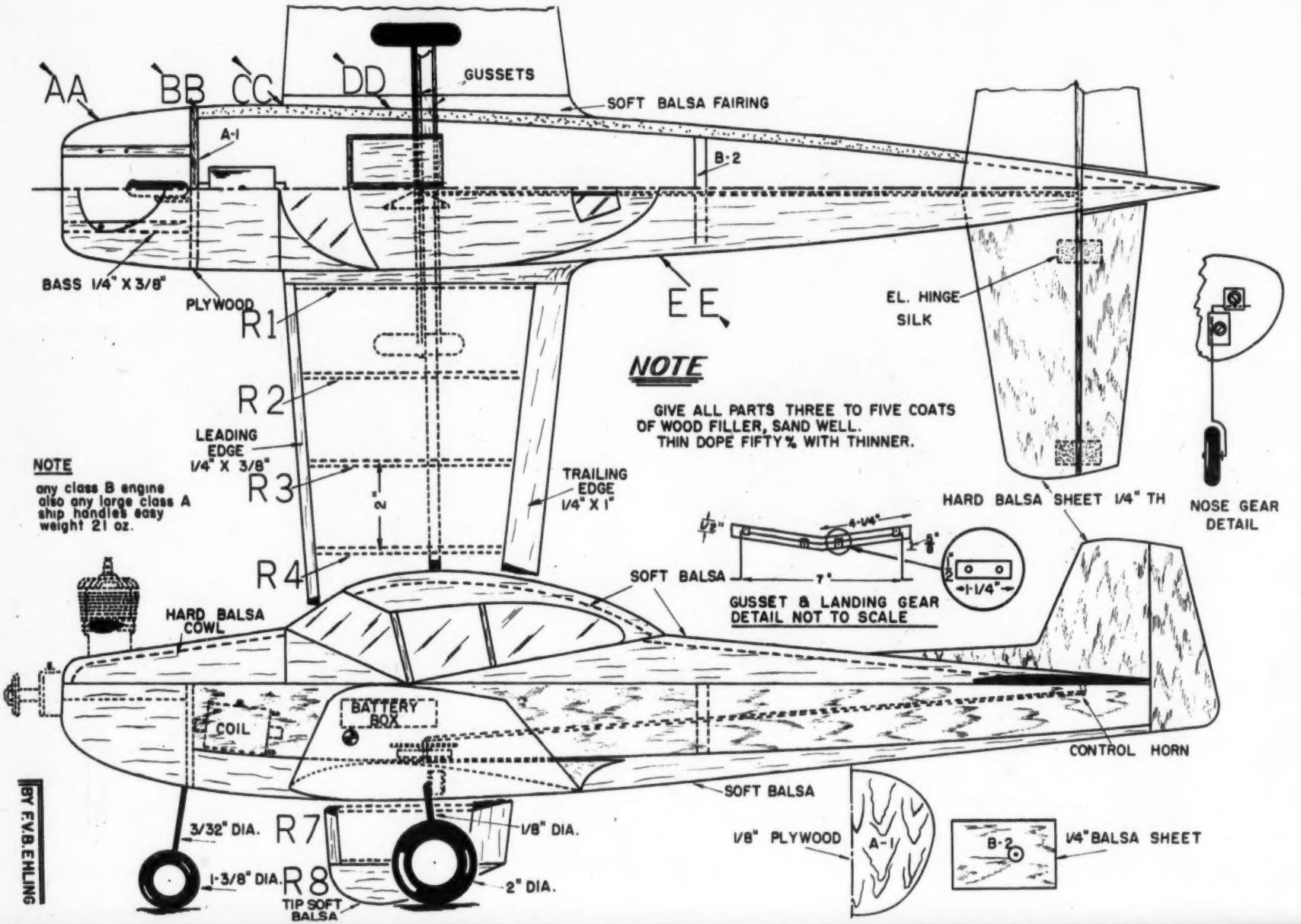
FUSELAGE—We start with sides which are cut from 1/4" sheet balsa. The firewall bulkhead is cemented in place as is the other bulkhead located midway in the fuselage. This is all there is to the framework; the rest of the blocks are cut to shape with the aid of the templates on page 19 and should offer little trouble in fitting. The lower block need not be hollowed as the extra strength that is gained will offset the weight. The other blocks can be hollowed to a wall thickness of 1/4". At this time the nose gear can be cut to shape and bolted in place. A slot for the wing is cut in the lower block to pass the spar which will be cemented in later. Install the controls along with the ignition system and take care that a good job is done as that is the theme to good engine performance. The cabin can now be added to complete the fuselage.

STABILIZER AND RUDDER — These are cut to shape and sanded to cross-section as shown. The rudder is cemented in place; however, before installation the stabilizer must be cut and the silk hinges added along with a control horn. Assemble the elevator and install the entire unit in place. This installation will be complete when the controls work freely; this is a necessity for consistent performance.

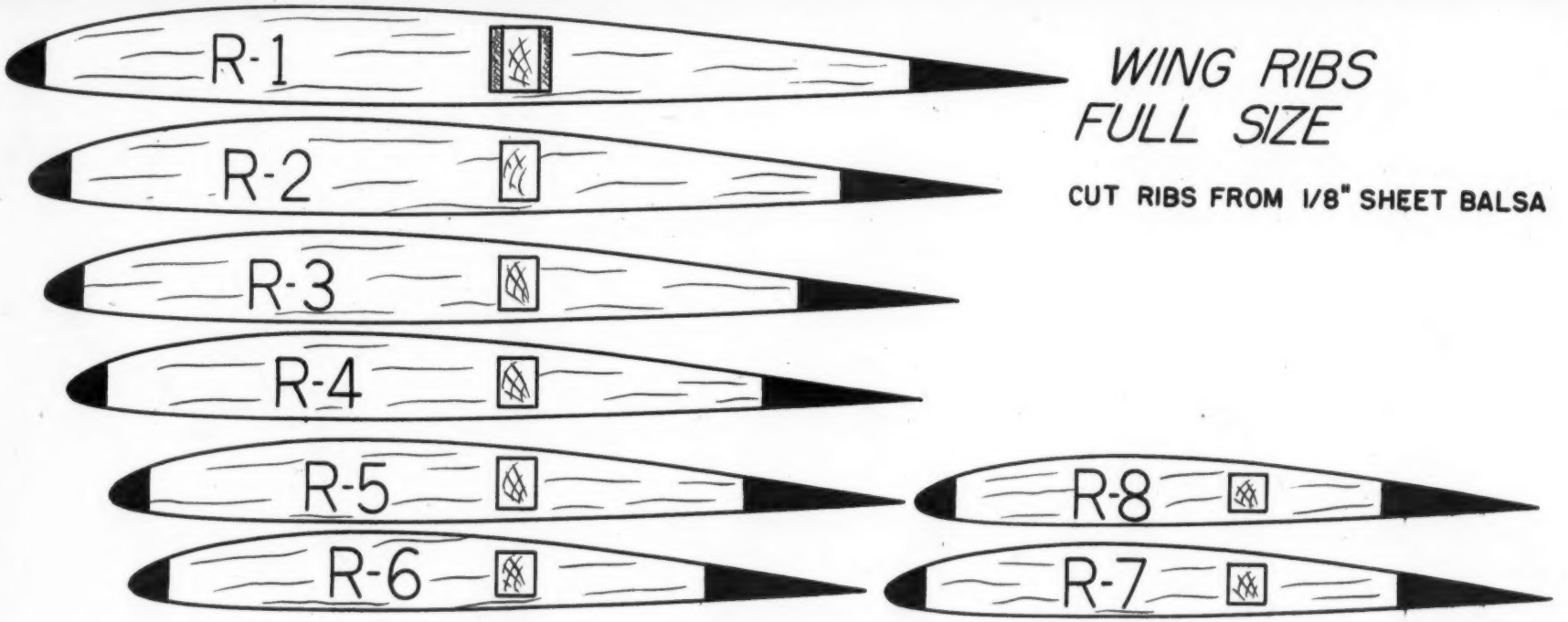
WING—The wing isn't as hard to make as you would suppose. The planking is easy if carried out with strips of 1/8" x 1/2" balsa, for in this way all curves are eliminated and there is no bending of planks—simply cement them in place. Construction is started by forming the framework of leading and trailing edges, connected together with all ribs including R8 at the tip. After the framework is complete the landing gear is installed on the reinforced spar and the assembly planked. Now sand the wing well, then cement to the fuselage and add the root fairing blocks. These are formed to shape as shown on the plan.

The whole ship is now sanded and given a coat of wood filler. This in turn is sanded, and if the pores of the wood are still visible the process is repeated. To dope the ship, cut the dope 50% with thinner as this will allow the solution to be brushed on well and not pile up. Sand

(*Turn to page* 83)



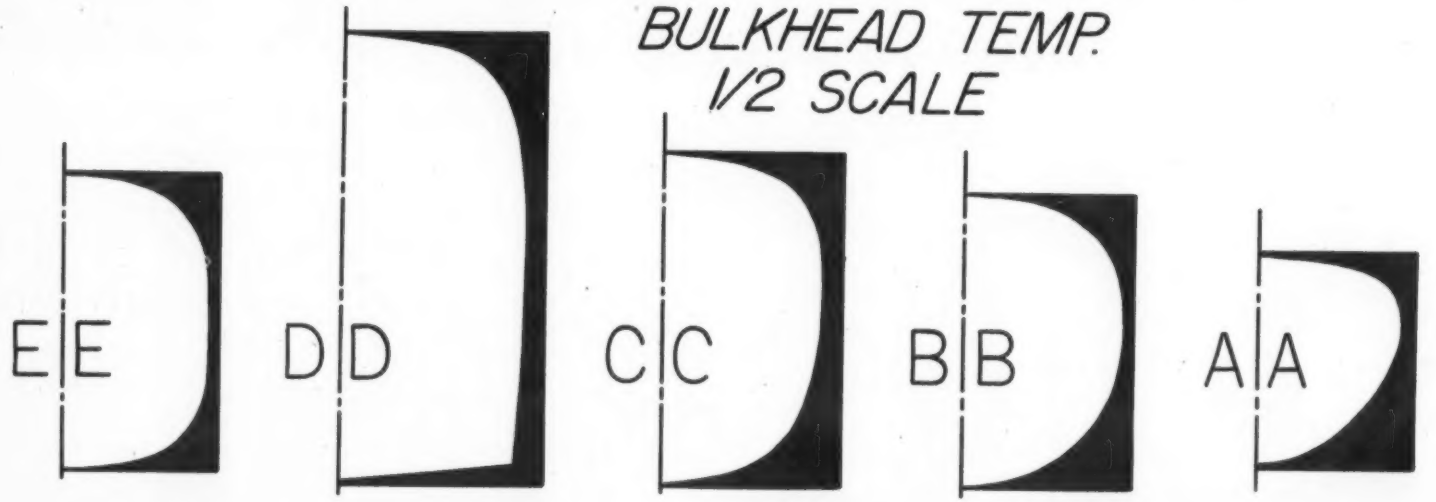
BY F.V.B. EHLING



WING RIBS FULL SIZE

CUT RIBS FROM 1/8" SHEET BALSA

BULKHEAD TEMP. 1/2 SCALE



DESIGN FORUM

Designs this month run from tailless jobs to those without wings

by CHARLES H. GRANT

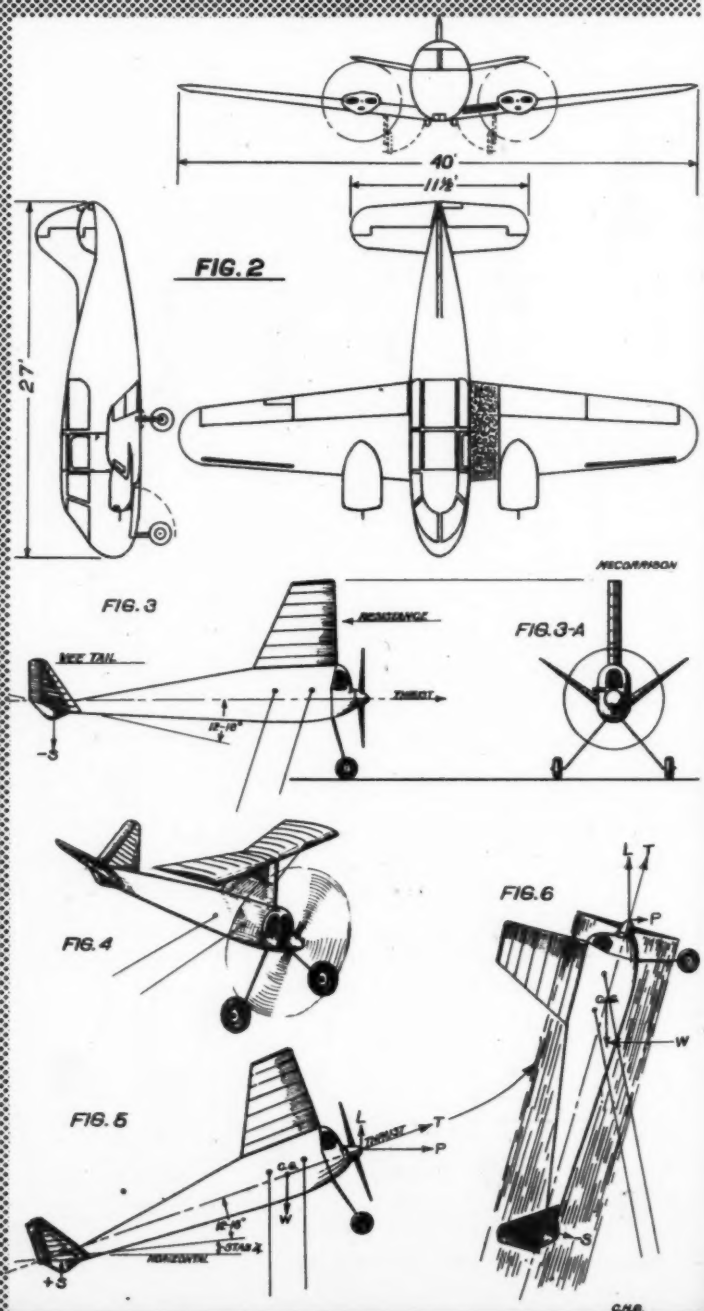
A NUMBER of our embryo designers are taking the cue from the innovation of jet propulsion and research in tailless aircraft and are giving great attention to possible future designs embodying these two features. Now, as in the past, apparently our young men whose imagination has not been clipped by years of orthodox routine are showing the way to designs of the future. One of the most noteworthy received so far comes from Frank M. McKee Jr., 3718 Rhea Ave., Memphis 12, Tenn. Fig. 1 shows his conception of the future long range intercepter.

This design indicates remarkable insight, or possibly intuition, in respect to the aerodynamics of this kind of airplane. Without question, successful and efficient full scale aircraft can be built exactly as he has pictured. Tailless aircraft, especially where jet propulsion is used, are much to be desired from an efficiency standpoint. In the past the chief problem has been stability. In Mr. McKee's design we believe he will obtain both. The ever present problem of longitudinal stability has been solved by sweeping back the wings at considerable angle so that the wing tips are 2 to 2-1/2 times the average wing chord from c.g. Wing tips on tailless planes serve as longitudinal stabilizers so stabilizers are nearly as far to the rear in this case as on the orthodox airplane. Nor do we believe that the unusual sweepback will result in inefficiency.

The wing of the average airplane at high speed is much larger than required for support. This excessive area must be carried in order to provide sufficient lift for landing. If the airplane is designed for high speed alone, about 1/3 of the wing would be required. Mr. McKee has arranged his wing so that the center portion, which is approximately 1/3 of the total area, will give maximum lift at high speed and therefore should carry the full load of the airplane. The wingtips comprising the other 2/3 will probably provide a little lift, but generally speaking will pass through the air at zero angle of attack except at the tips which will be slightly negative for stability.

So we see that this airplane basically

(*Turn to page 47*)



Part Two

Neptune

by JOHN F. P. FORSTER

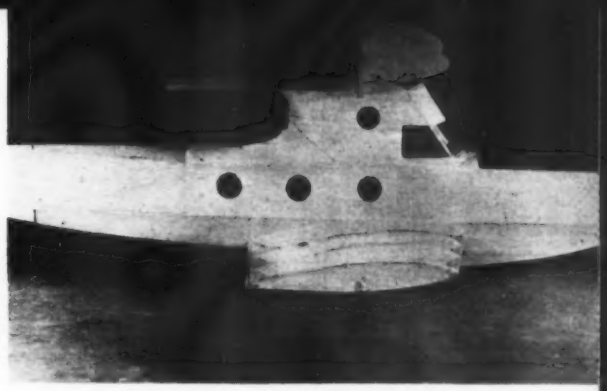


Fig. 8 above. Pylon bracing complete and porthole section installed. Fig. 9 below. Note how hull and tail section blend smoothly together

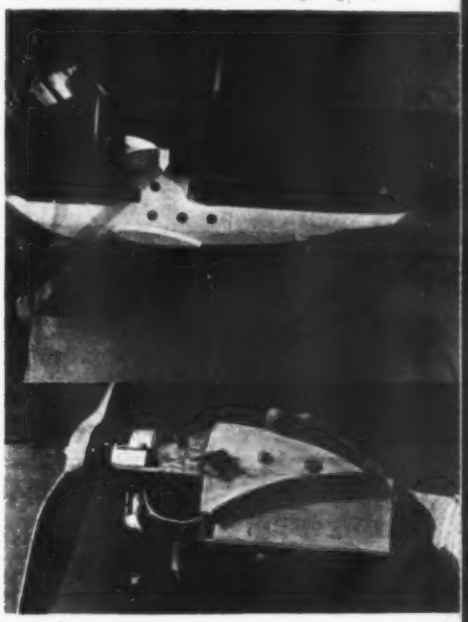
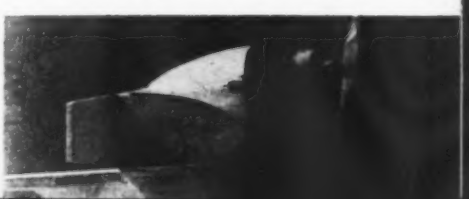


Fig. 10 above. The removable power unit facilitates servicing. Fig. 11 below. A tiny storage cell is used on the original model

Fig. 12 above. The power unit fits snugly between the pylon nose ribs. Fig. 13 below. A pin (not visible here) holds the unit in place



Concluding instructions are presented here for completing and testing a proven flying boat

TAIL BOOM—This follows normal monocoque practice and requires no comment beyond the fact that it is built on a central vertical sheet of 1/16" balsa held flat on a baseboard while one-half is planked. The latter then keeps it true while the half formers on the other side are applied and planked. It is advisable to complete this before locating the top half of F6 on the hull.

The dowel holes in male and female formers should be drilled with both clamped in a vise before construction commences so as to insure accurate fitting.

With the lower pair of dowels pushed home into the rear step block (F9) of the hull, F6 is then pushed on to the top pair of dowels and glued into position lying flat up against S-1 of the tail boom. Strips of 3/64" 3-ply are glued across this joint with the lower half of F6 and a few strips of planking or stringers countersunk into the circumference of F4, 5 and 6. These will later be covered by final planking but serve to brace F6 in position, so that the tail boom can now be unplugged from the hull without displacing F6.

PLANKING PYLON AND HULL TOP—On the original model I have a slipstream-operated flight timer made of brass throughout (to avoid sea-water corrosion) which was built into the pylon at this stage of construction. It is of course optional, and if omitted the next step is to sheath the whole pylon with a single sheet of 1/32" windshield celluloid. The shape is ascertained by testing out with a sheet of stiff paper first and using this as a template. Half round blocks of soft balsa are inserted above and below the cockpit windshield between the sloping struts. The celluloid is freely glued to these, stretched back on either side of the pylon, securely glued to the struts and edge of the M.P.F. and finally brought together into a fairly sharp knife-edge around the concave trailing edge of the 3-ply C. L. S. Odd pieces of balsa packing may be used where necessary. Lower edge of the celluloid flares outwards slightly over Formers 4 and 5 to which it is glued and this forms a very strong stressed skin for the pylon.

It is finally covered with a thin veneer of 1/32" sheet balsa leaving cutaways for the cockpit windshield and side windows and the circular windows above and behind through which the flight timer gearing can be inspected. This veneer is carried down and flared on to the sides of Formers 3a, 4 and 5. Its lower edge is later overlapped and faired smoothly into the hull planking.

The three cabin portholes in the sides of the hull are optional but I think they enhance realistic appearance. They cannot be cut after planking and are best cut on the flat. A single sheet of celluloid is glued along all three on the *inside*, taking care that they are watertight. The 3" wide sheet of 1/16" thus reinforced is laid on in one sheet from F6 to the nose block and well glued to all formers and to the veneer skin of the pylon. Photo 9 gives a good impression of the sweeping lines of hull and tail boom, now almost imperceptibly united and complete except for top decking in front of the cockpit.

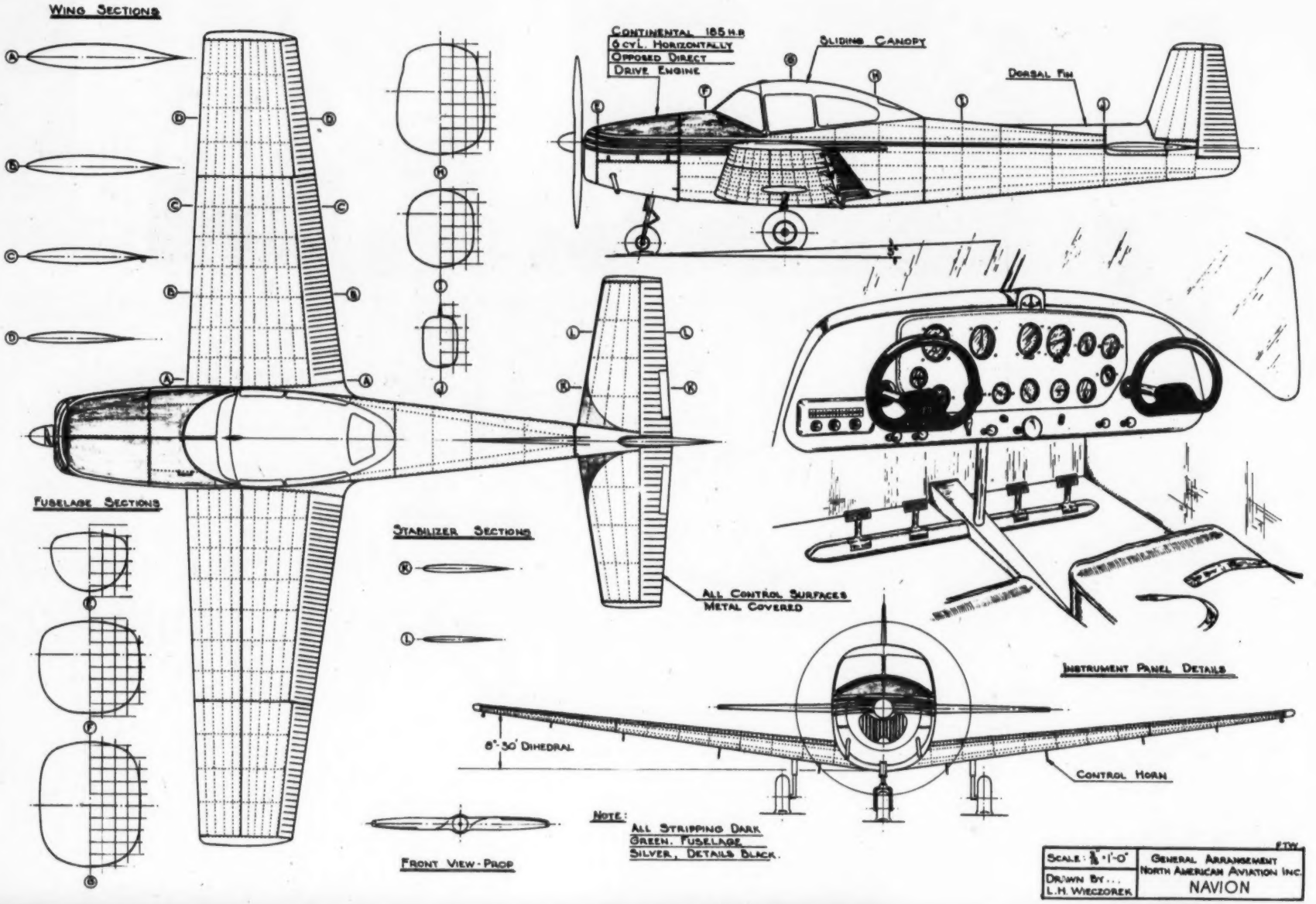
DETACHABLE ENGINE NACELLE—This houses all "the works" (except my pylon housed flight timer) and in the unfortunate event of a ducking, can be removed and dried off in the oven or airing cupboard overnight! The whole affair slides in like a drawer between the two 1/4" thick centersection riblets, which are pegged to the sides of the cockpit roof block to withstand engine vibration. A study of photos 10, 11 and 12 and the plans should make its construction quite clear. Note the 3-ply "flange" which fits snug and practically watertight over the leading edge of the centersection. A vertical removable dowel peg passes down through the motor unit into the block forming the cockpit roof, and so prevents the engine rushing off on its own without the ship! Yeah—it once happened on land when I forgot to insert this locating peg! I'd be mourning the loss of a Brown Jr. if it had happened at sea.

WING FIXING—This is now my standard practice on high and low wing models. It is extremely simple and absolutely crashproof and looks clean, but requires a little care and time in construction. The wing halves are identical except for dowels in one and corresponding holes in the other, and their construction is clear from the plan. These are completed before building up the centersection stub around which they fit.

First cut a template of 3-ply corresponding exactly with the exposed inner face of wing rib 3. Cut out the 3/16" x 3/4" slot and use this to mark the position of the tongue in the centersection spar and outer riblet. Then glue this template to the inner face of wing rib 3 and cut the slot through the rib itself.

The outer riblet of the centersection is dovetailed onto the main spar. Before gluing this dovetail joint, bring the wing into position and pin the outer riblet temporarily to the plywood facing of wing rib 3 while the glue of the dovetail sets, and at the same time countersink a leading edge spar into riblets 1, 2 and 3 of the centersection. This insures correct align-

(*Turn to page* 40)


WING SECTIONS
FUSELAGE SECTIONS
STABILIZER SECTIONS
FRONT VIEW - PROP
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NAVION

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Lines of the P-51 Mustang are evident in this sleek all metal private plane

PLANE ON THE COVER

Navion

WITH minor variations, questionnaires during the past year have asked the prospective private plane owner: "Would you pay as high as $5,000 for a postwar lightplane?" And the crescendo of "no's" has thundered back through the mails so loudly that the price bracket has virtually been removed from the lightplane category. Yet, from all appearances, hundreds of lightplane buyers are going to pay not only $5,000 but $6,100 for their postwar lightplane and gladly. The reason: North American's sleek new *Navion*.

Last August, James Howard ("Dutch") Kindelberger, NAA president, philosophically watched the last AT-6 *Texan* roll off the company's Dallas production line and, simultaneously, saw the last B-25 *Mitchell* speed down the runway of the big Kansas City plant. He was stoic about it because he had realized all along that it had to come sooner or later, and for four months he had known with reasonable accuracy the date it would happen. But when, on November 15 last, he watched the final P-51 *Mustang* creep slowly along the production line, its cradle being disassembled after it, he wasn't so philosophical; for the *Mustang* had been Dutch's baby for more than five years!

When the bottom dropped out of his business on V-J Day, "Dutch" was not alone; all the 20 "big" plants shared his tears. These big company presidents had a lot of decisions to make last fall, but overshadowing the complex panorama of cancellations, work-in-progress disposal, etc., was the one frightening decision: "What next?"

Boeing had its bombers and the postwar *Stratocruiser* on the list; Douglas had three commercial airliner models for sale; Curtiss was talking of merger with Lockheed, who had more *Constellation* orders than two years of hard work could complete; Consolidated-Vultee had the works: all the way from the Stinson *Voyager* to the brobdingnagian Model 37 on the books; and so down the list. Through "Dutch's" eyes their problems looked far simpler than his own; what does a manufacturer of military aircraft exclusively for 12 years do when the war is over?

One solution was the design of more advanced military aircraft and NAA engineers had produced a full stable of them, half still classified by the Army and Navy. But in Washington, "economy" was becoming the order of the day, and this made bleak the outlook for military aircraft.

So "Dutch" made his decision and became the second major military aircraft producer in the nation to embrace the personal airplane (following Republic's *Seabee* lead). With an untold fortune in aircraft design know-how tucked away in his engineering department, "Dutch" quickly visualized the insanity of tossing it overboard by producing the all-too-prevalent "welded-steel-tubing-fabric-covered" lightplane design. If NAA was to build a personal airplane it had to be the fastest, neatest, most modern in the world. And the men who had produced the war-winning *Mustang* could meet this rigid specification quickly and easily.

From a standing V-J Day start, the NAA design-production team took off against a Christmas 1945 deadline. And when the holiday rolled around "Dutch's" Christmas present took to the sky—it became the first truly postwar personal airplane, and its lines were of the type that make buyers forget the price tag.

The uninitiated might describe the *Navion* as a "conventional" low wing monoplane, but "Dutch's" know-how has seen to it that the new product is anything but that—it is bursting with new ideas. Salient point of the *Navion* is its four place accommodations enclosed in a huge bubble canopy, which has created the impression that it is predominately the *Mustang's* new colt. Although the layman's chronic decision is that anything with a wing, fuselage and tail "looks just like" some other airplane of their acquaintance, even an engineer will recognize the square wing tips, square fin and stabilizer tips and the severe polygon of the wing planform of the *Mustang*. Close observers will even detect a tiny dorsal

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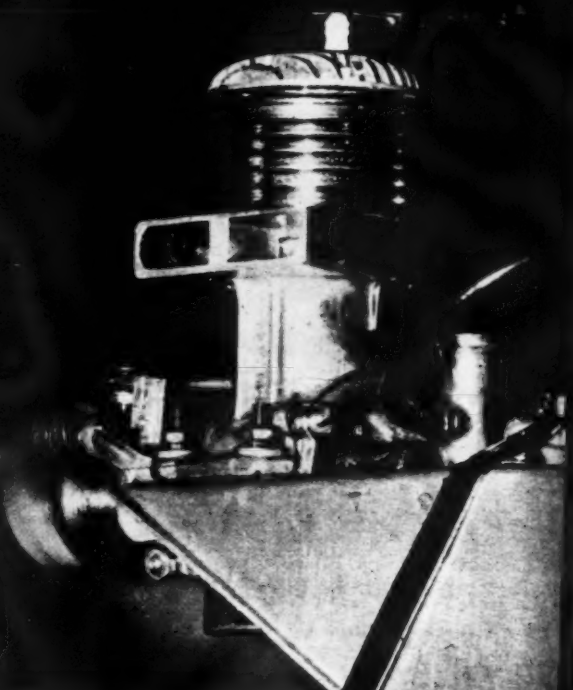

Propeller Design

by W. H. S. BIRD and J. S. LUCK

The principles of low speed aerodynamics are herein applied to the design of model airplane propellers. Readers should study Mr. Bird's article in the April issue before tackling this one

Fig. 1. Blade shapes of three popular commercial propellers. Reynolds Numbers are based on 12" dia., 7" pitch and 6000 rpm.

LET it be said at the outset that this is to be no highly technical treatise upon the intricacies of designing and making the perfect propeller. Rather, it presents a collection of pertinent theory which has, quite frankly, not yet been completely substantiated by subsequent practical experiments on actual propellers.

So far, fairly conclusive data has been gathered from tests on model airplane wings and there seems to be no reason why similar theory applied to propellers should not give equivalently amazing performance improvements.

The effects of R (Reynolds Number) upon the characteristics of airfoils has already been published in a previous article*, but to cover the present topic comprehensively, it would seem in order to repeat some of the facts which have a direct bearing on propellers. It has been proved, for instance, that an exact scaled-down replica could not hold to the same performance characteristics as a full size airplane while still retaining some relation to our concept of a free flight model. Only if the R of both full-scale and model wing were the same could they be considered as having the same lift and drag values. From the formula $R=6378vl$, where v is velocity of the aircraft in f.p.s., and l the wing chord in ft., it is seen that a one-tenth scale model wing, for example, would have to travel at ten times the speed of the full size wing—an impossible condition for the model airplane to meet. The Reynolds Number is then a measurement of scale effect, and as such is not in itself a material factor but indicates directly the range of the scale in which the airfoil operates and thus becomes perhaps the most important measurement in the aeromodelers' book of formulae.

The point in the aerodynamic scale at which the boundary layer of an airfoil

*Model Airplane News, May 1946.

changes from *laminar* to *turbulent* is called the critical Reynolds Number. For the well known Clark Y it is in the region of 500,000 and is about 180,000 for the popular N.A.C.A. 6409.

At sub-critical R the boundary layer is laminar at low angles of attack, and as the angle increases it readily breaks away to cause a kind of early miniature stall with disastrous effects upon lift and a great increase in drag. On the other hand, in the super-critical range the boundary layer is turbulent and the separation effect is greatly delayed, keeping lift up and drag down for far larger angles of attack. For maximum efficiency it is realized that the *boundary layer must be turbulent*. This can be done by (a) raising R into the super-critical range, and (b) creating artificial turbulence by sharpening or roughening the leading edge or by means of a turbulence wire stretched in front of the airfoil at about a ninth of the chord ahead of the leading edge.

What of the model airplane prop? Certainly effects of R are just as profound here as they were for the wing. It would appear that it has been a mistake to pattern the present average gas model propellers after the full scale counterpart. Evidently it has been assumed that because the big prop has a thick root, a smoothly faired blade shape with the maximum width about half or two-thirds the radius from the hub and has elliptical or even sharp tips, the model propeller should follow suit. Theoretically, however, the blade should be left as wide as possible all the way out to the tips. Instead of the usual Clark Y type section the ideal would be more like the N.A.C.A. 6412, 6409 or 6406; far from a glass-smooth finish, the hypothetical ideal should have the first third of the blade-width along the leading edge roughened or serrated.

Does that sound crazy? Do we hear the fruity sound of derision? If so, the reader need read no further; but the chance to gain a couple of additional mph or extra few feet of altitude will become lost to the doubtful. So, if the reader is still interested, struggle on, and reasons behind the theory will be expounded.

Disregarding the prodigious amount of available theory relating to full scale propeller design and efficiency, and disregarding also the standard nomenclature, the propeller may be thought of as a junior wing being driven in a circle by the motor. The same forces of lift and drag apply whether the wing be great or small, except that in the propeller's case the lift becomes *thrust* and the *drag* must be overcome by the motor before the excess power is available to produce thrust. Therefore the lower the drag the greater the thrust, and for the same motive power the ship will go faster or higher.

R once more enters the picture. To apply the simple formula, $R=6378vl$, the value of v for any blade element is $\frac{2\pi r}{12}\times\frac{RPM}{60}$; where r equals distance of the blade element* from the hub center in inches, RPM is motor speed in revolutions per minute, and l is equal to the chord of the element *in inches*. In simpler terms the formula may be expressed as $R=4.65\ rl\times RPM$.

*Any crossection of the blade width at a given distance from the hub center.

Refer to Fig. 1 where the outlines of three popular commercially made propellers are shown with corresponding values of R at various points along the blade. For practical purposes an engine speed of 5000 rpm and 14" dia. props have been assumed. It will be noted that all three examples have a thick root tapering off to a section resembling a Clark Y at the tips. At no point along the blade does any element reach even close to critical R for that particular type of airfoil and all evidence points to drag being well up and thrust comparatively low. The sharply tapered tips preclude all opportunity to raise the values into a more favorable range. Fig. 2 shows R of the blade elements plotted against their distances from the hub center. The curves of the three standard props slope up nicely toward the higher values and then, at about two-thirds along the blade, begin to fall off rapidly towards zero.

How then should we design the most efficient propeller? A hypothesis based upon known facts might lead to the compromise in Fig. 3. If the ideal thin sections were usable there would be a fair chance of promoting the turbulent boundary layer, but the prop would be weak and, unless made of very heavy material, would contribute nothing to flywheel effect. Again, if the leading edge were sharpened it would not only be easily damaged, but the local flying field would soon become inches deep in neatly severed fingers. So, since it is not always practical to use an ideal section, i.e. one that reaches the super-critical state at low R, it becomes necessary to strike a compromise between the ideal and the practical by selecting a slightly less efficient airfoil and attempting to assure a turbulent boundary layer by other means.

First, R must be made as high as possible by widening the blade. Disregarding the full scale practice of tapering off the

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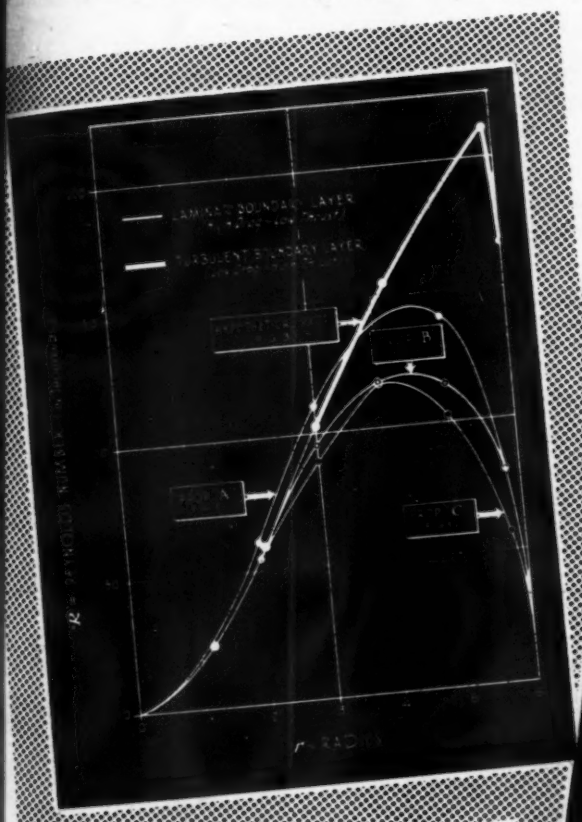
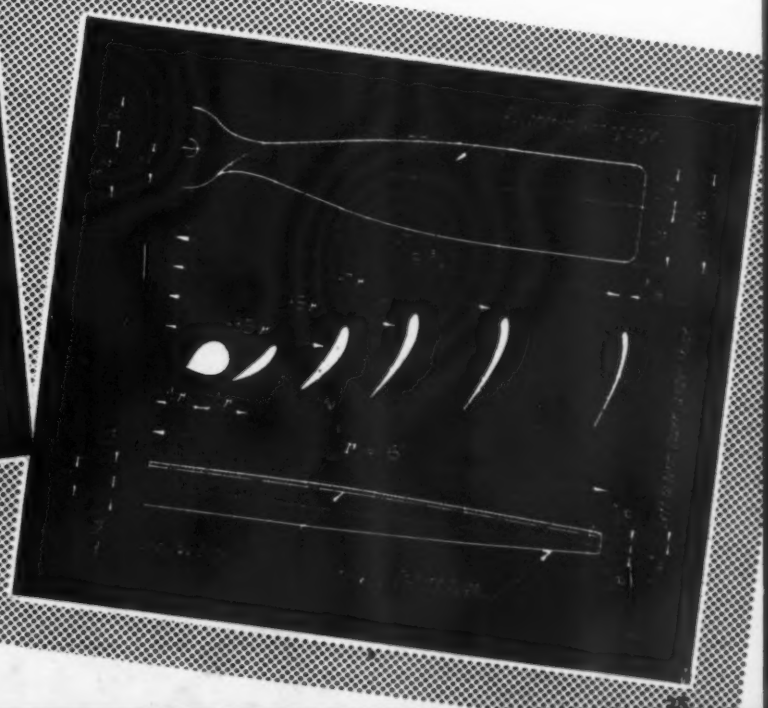


(Above) Fig. 2. Reynolds Numbers depicted graphically for the same three propellers shown in Fig. 1

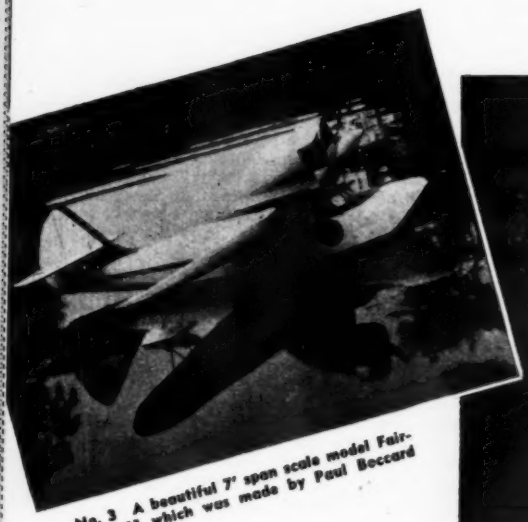
(Below) Fig. 3. An experimental propeller of 12" dia. and 7" pitch prepared according to the principles outlined above



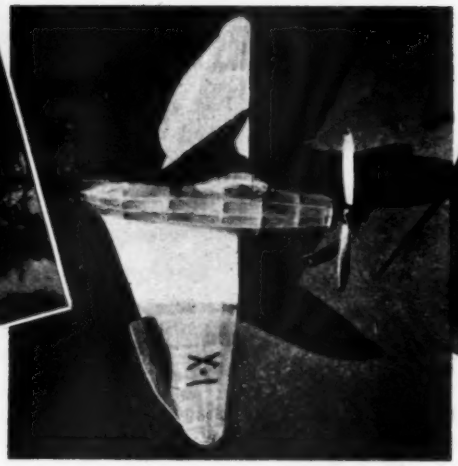
No. 1 A Douglas O-38 which took Ed Sholander a year of on-and-off work to finish

No. 2 Solid model P-51 by Robert Romeo has 15" span and all the details he could pile on

Air Ways



No. 3 A beautiful 7' span scale model Fairchild 91 which was made by Paul Boccard



No. 4 Norman Kessuth designed this tailless model which was built by a friend

No. 5 Built in Mexico by Franco Ciprez, this sleek helicopter is the model for a full size ship he hopes to build

News of model airplane experimenters from all over the world

WE RECEIVE notice almost every day of new clubs formed and of old ones being reactivated. A surprising number of the newcomers write that they wish to affiliate with the Academy of Model Aeronautics but do not know what procedure to follow. It is really simple—just write to the AMA at 1025 Connecticut Avenue, N.W., Washington 6 D.C. for application blanks. A very reasonable fee (based on club membership) is required which goes to defray expenses of the Academy. Member clubs receive complete data on contest work, model flying rules and other related subjects. A supply of blanks for model licenses for individual members is also included.

We also hear from model builders in isolated sections who are "lone wolves" in the sense that there are no other builders within reasonable distance and, of course, no model clubs nearby. Such modelers can also join the AMA by applying for a model flyer's license, and we

No. 6 Bill Taylor sent this shot of his favorite, a Curtiss P-40 which has 40" span

No. 7 A beautiful contest model by R. Gerard which is grounded due to lack of rubber

No. 8 This minutely detailed SE-5 by C. W. Frey, made from Wylam plans, has span of 3½"

No. 12 Snappy looking control liner by A. H. Requarth has inverted Atwood engine which he hopes will produce real high speeds

No. 11 A high performance glider from Argentina, built by Elieser Benchimol, who says they are plagued by a rubber shortage

urge every such builder that he do so.

CONTEST RULES—Inasmuch as this is the last issue to reach you before the Nationals, let us say that no further rule changes have been brought to light at this writing. The AMA rules were printed in the April and May issues of M.A.N. Some confusion has occurred, however, regarding the control line regulations which are the only ones that have been changed in the last few years. Note that the paragraph headed "Temporary Rules and Regulations — Controlled Model Airplanes" on page 42 of the May issue details the rules that were put in force Sept. 21, 1945 and superseded those published in the April issue under Section III (C). These temporary rules are still in force.

* *

Picture No. 1 shows a built-up scale model of the Douglas O-38 submitted by Ed Sholander, 127 W. 110 St., Los Angeles 3, Calif. Although this model appears to be of built-up construction Ed says nothing about flying it, but he does tells us that he took a year to build it working in fits and starts. The fuselage is olive drab and the wings and tail are yellow, with motor and machine gun black. After coloring, the whole model was given a coat of varnish which Ed claims really peps up the finish.

The *Mustang* in No. 2 was built by Pvt. Robert Romeo whose home address is 1245 81st St., Brooklyn 28, N.Y. The model is carved from medium hard balsa, which material Bob claims is ideal for the purpose, and it has a 15" wingspan. All possible details in the cockpit and elsewhere were added. The bubble canopy which Bob rightly claims is one of the most important features of such a model was formed by stretching a thin sheet of plexiglas over a hardwood form after the plastic had been heated to 250° for about five minutes. The model was finished with many coats of wood filler and dope to produce a really perfect surface. Bob says that life in the AAF makes it a bit difficult to continue his model activities but he expects to be out before long and back to the old balsa woodpile.

We do not have much detail on the beautiful flying boat in No. 3 sent in by Ronald Boccard. He tells us it is a Fairchild 91 built in 1939 by his uncle, Paul Boccard, who lives at 39-81 49th St., Long Island City 4, L.I., N.Y. The model has a 7' wingspan; the wings are silk covered and the body is planked. It is powered by a *Super Cyclone* and Ronald says it reaches rather high speeds for a free flight job.

No. 4 shows a very successful rubber powered tailless model built by La Verne Tratechaud. The model, designed by Norman Kossuth of 86 Cedarhurst, Detroit 3, Mich., has a span of 22" and a length of 13". The inverted gull wings sweep forward and the model possesses unusual stability and is a rather fast flyer. It has been flown without the wing tabs which are apparent in the photograph but requires weight in the tail when this is done.

The helicopter in No. 5 was built by Franco Bucio Cipres, Huasteca No. 178, Col. Industrial, Mexico, D.F. He designed this model to test out ideas for a full size helicopter which he hopes to build when it becomes economically possible. The model has been thoroughly engineered for power loading, drag, etc. and has been wind-tunnel tested. He doesn't tell us much of the flying qualities of the model although he says it was powered by an electric motor and has produced very good results. Mr. Cipres is at present seeking a backer to aid him in the production of a full sized ship.

Bill Taylor writes that the P-40 in No. 6 is his favorite of the many scale models he has built including the P-39, P-51, etc. This model, which has a 40" span and 3½" length, is completely covered with Silkspan over which were applied 7 coats of dope. This is another ship on which, although it appears to be of built-up construction, the details of flying qualities are missing.

An English builder, R. Gerard, 42 Houghton Rd., Grantham, Lincolnshire, sent No. 7 showing the fuselage of his endurance model just before covering. This is a copy of Frank Zaic's 1938 *New Yorker* which Mr. Gerard found easy to build. He has been unable to fly it as yet due to shortage of rubber but probably by the time this appears in print the model will have made its maiden voyage.

The beautiful little SE-5 in No. 8 was constructed by C. W. Frey of 220 Zara St., Pittsburgh 10, Penna. It has a span of only 3½" and, as is apparent from the photograph, a great amount of detail has been included. This model was built from Wylam's plans appearing in MODEL AIRPLANE NEWS and was constructed to a scale of ⅛" to the foot. Mr. Frey writes: "After building the SE-5 I found that it created so much interest because of its minuteness that I decided to build a collection of models to this scale." He also sent us a photograph of an equally nicely detailed DH-4 which has a span of only 5".

No. 9 shows a sleek U-control model of the PT-19 *Cornell* which has a 36" span and was built by Alfred Neuhaus. The *Ohlsson* motor is mounted on its side and has been found to run very well this way. Although this ship was not made for high speed it travels from 50 to 60 mph and handles very easily. At the time the pictures were taken the ship had logged 21 flights and 7 loops without even a broken prop. The body is completely planked as are the leading edges of the rudder, elevator and wing, and the complete job is silk covered with 7 coats of yellow dope and black trim. Although this is a flying model many unusual details have been included.

Another ship with horizontal motor mounting is shown in No. 10. This twin control liner, built by D. R. Johnson, Burbank, Calif., is powered by two *Ohlsson* 23's with 8" propellers and it is all-balsa construction. Mr. Johnson originally intended to include retractable gears but this has been abandoned for the time being until smaller batteries can be obtained. This is certainly an ambitious

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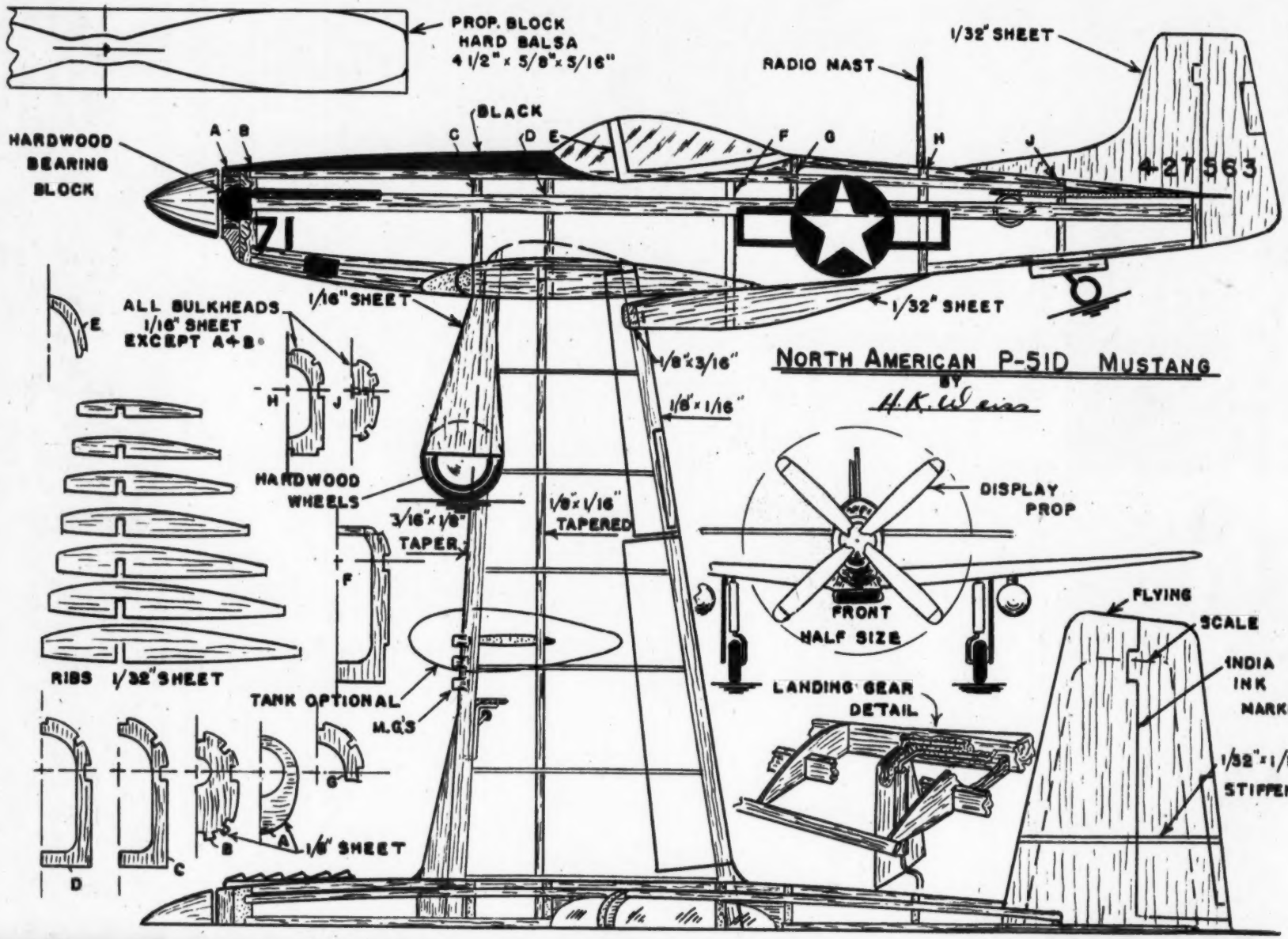
No. 9 Control line model of PT-19 Cornell has Ohlsson engine and even though super detailed is a fine flyer

No. 10 Twin engine model with the power plants placed horizontally and well-cowled was built by D. R. Johnson who tells us it has a span of 36"


PROP. BLOCK
HARD BALSA
4 1/2" x 5/8" x 3/16"
1/32" SHEET
RADIO MAST
BLACK
HARDWOOD
BEARING
BLOCK
A B C D E F G H J
4-27563
ALL BULKHEADS
1/16" SHEET
EXCEPT A+B
1/16" SHEET
1/32" SHEET
1/8" x 3/16"
1/8" x 1/16"
NORTH AMERICAN P-51D MUSTANG
BY
H. K. Weiss
HARDWOOD
WHEELS
3/16" x 1/8"
TAPER
1/8" x 1/16"
TAPERED
DISPLAY
PROP
FRONT
HALF SIZE
FLYING
SCALE
INDIA
INK
MARKINGS
RIBS 1/32" SHEET
TANK OPTIONAL
M.G.'S
LANDING GEAR
DETAIL
1/32" x 1/16"
STIFFENER
1/8" SHEET

Mustang Fighter

After a lapse of several years we again present our popular "Minute Models"

by H. K. WEISS

HERE'S one of the super-fighters of the war: a ship that was in it from the beginning and grew to tremendous stature before it was over—the North American *Mustang*. The *Mustang* in its various versions has seen service in all theatres of the war from France to Burma to Poland. Limited to a cruising range of only 600 miles back in 1940 when it first rolled off the drafting board, by 1945 it was flying bomber escort from England to Poland and back. It has been powered by the American *Allison* engine and the British *Merlin*. It appeared as a low altitude fighter, high altitude fighter, dive bomber, attack plane, and even as a two place trainer. It has carried as armament, rockets, wing bombs, fire bombs, and an arsenal of .50 caliber machine guns.

Finally, North American designers must have decided that the only thing better than a single *Mustang* was twins, because the P-82—latest *Mustang*, developed too late to reach combat—was built up from P-51H parts with two almost standard fuselages, two engines, and two rudders, coupled to a single wing only 25% larger than a P-51H wing. The curious looking combination can be used as a night fighter with radar, attack plane with 14 machine guns for ground strafing, and a long range super escort fighter which will accompany its "Big Friends" anywhere in the world. And it can do all this at 475 mph!

Our model however is the P-51D, one of the most highly developed of the single seaters. It can be distinguished from its predecessors primarily by its dorsal fin and bubble canopy. It's a small ship but ruggedly built, and a natural flyer, thanks to the original *Mustang* proportions.

WINGS AND TAIL—The wing is the starting point of construction. It is best assembled right over the plan, with a piece of waxed paper between the frame and the plan to keep the frame from sticking. The left half of the wing is of course a mirror image of the right, and dimensions can be transferred to the left half directly from the right.

First cut out the ribs from 1/32" sheet balsa. Cut leading edge, main spar and trailing edge from medium balsa, and taper them to fit the ribs. Pin them in place over the plan and cement the ribs firmly in place. It is a good idea to go over each cemented joint twice. Cement the additional piece of balsa that serves as wing fillet to the leading edge at the midsection.

When the frame is thoroughly dry, remove the pins and crack the spars carefully at the midsection so the tips can be raised for dihedral. Pin the frame down again, but this time with the tips each 1/2" above the table top. Cement the midsection carefully where it was cracked. While waiting for this to dry you can cut the wing tips from 1/16" sheet and cement them in place.

When all the cement is dry loosen the frame, round off the leading edge, and trim the trailing edge to a thin line. If you've been careful about cementing all joints you'll have a rigid wing frame that you can work with easily. Finally, sand the whole frame carefully so the joints of ribs and spars are smooth and will not cause bumps under the tissue when the frame is covered.

The tail surfaces are 1/32" sheet balsa, carefully cut out with a razor blade and sanded smooth. The stab is made in one piece and has two 1/32" by 1/16" stiffeners cemented to it to keep it from warping or cracking.

FUSELAGE—The fuselage is built up right on the wing. Start by cutting two halves of each fuselage bulkhead from 1/16" or 1/8" sheet as indicated on the plan. Cement the halves together and reinforce each bulkhead by two strips of 1/32" by 1/16" balsa cemented crosswise. You'll probably find it tedious to add these little strips, but they keep the fuselage from being easily crushed by rough handling (why do people like to squeeze fuselages?) and are well worth the trouble of putting them in.

Cement bulkheads C, D and F firmly to the wing centersection and add the two main 1/8" x 1/16" side stringers. The remaining bulkheads are added to these stringers, then the 1/16" sq. stringers are added. The stringers are all trimmed neatly at the tail, and the 1/16" by 1/8" tailpost added. The side panels of 1/32" sheet which form the belly airscoop are added, together with the airscoop front spacer of 1/8" by 3/16" balsa.

Now go over the fuselage carefully, adding cement to all of the joints that look as if they hadn't gotten enough the first time around. When this has dried, take up the frame and carefully sand it all over to get rid of rough spots and prepare it for covering. This last sanding of the entire frame as a unit is important in getting an expert covering job. It gets rid of a certain amount of weight, too.

Add the tail hook to bulkhead J. Note that there is a cross pin of music wire to keep the tail hook from pulling through the bulkhead.

LANDING GEAR—Note from the drawing that each wheel and side panel

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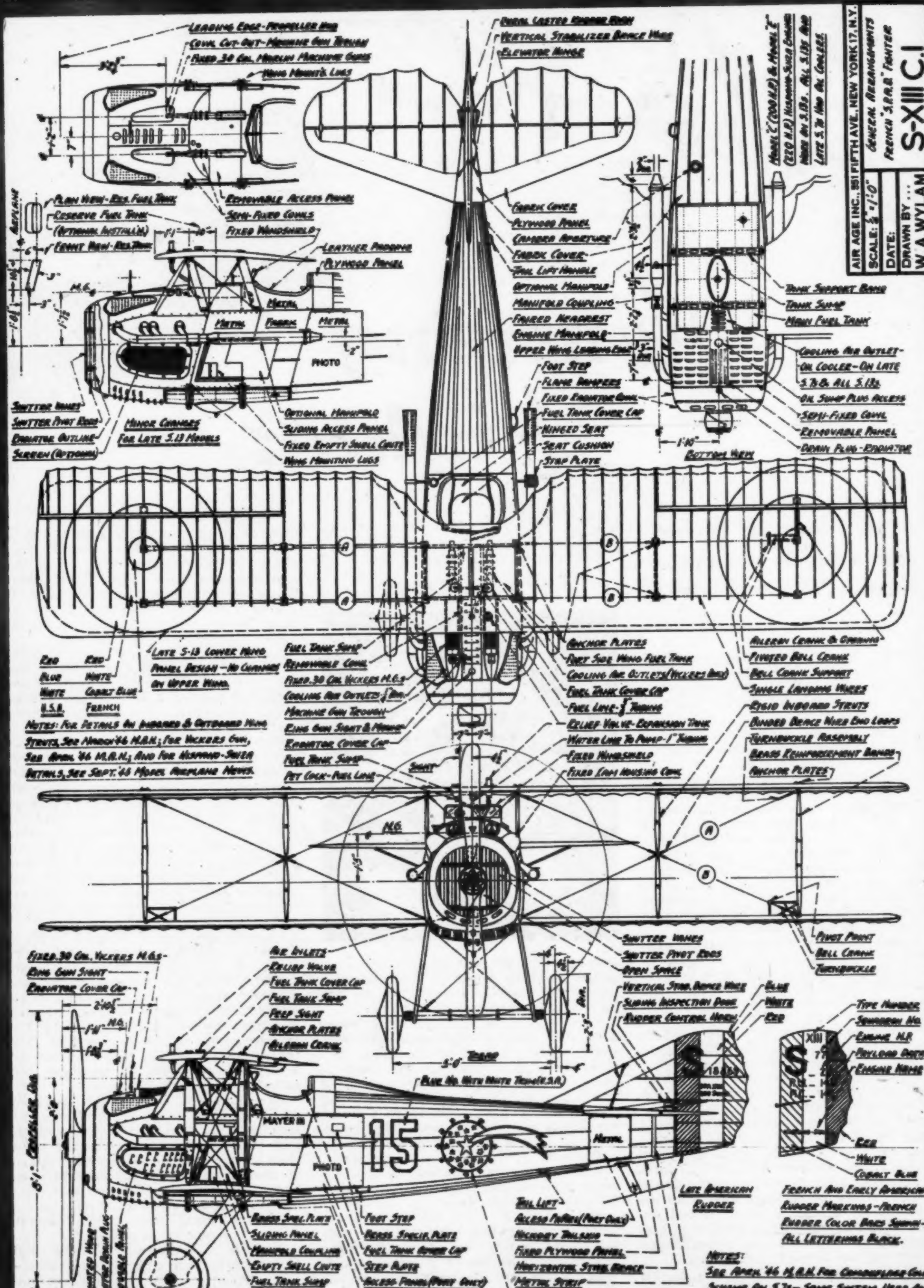
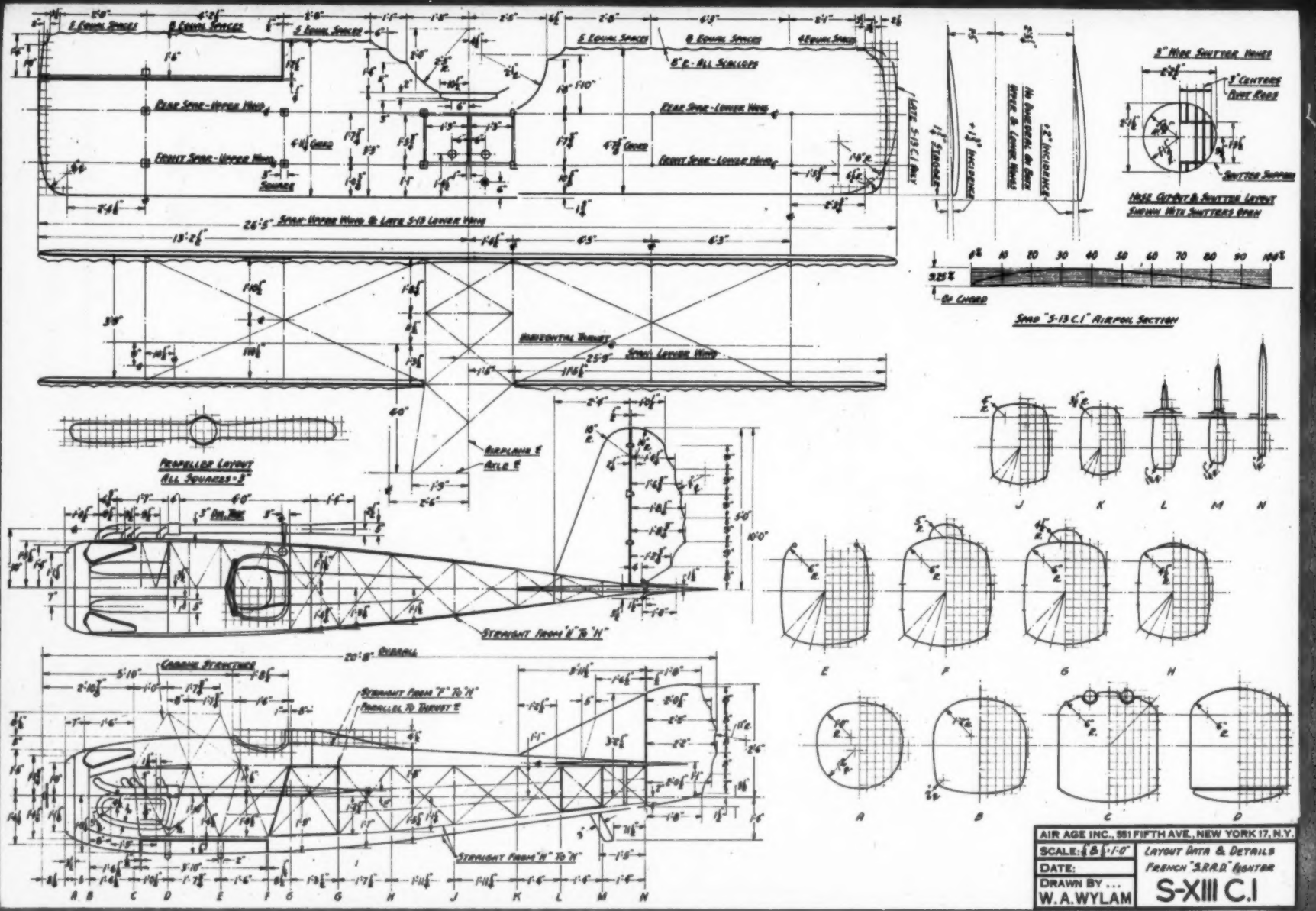
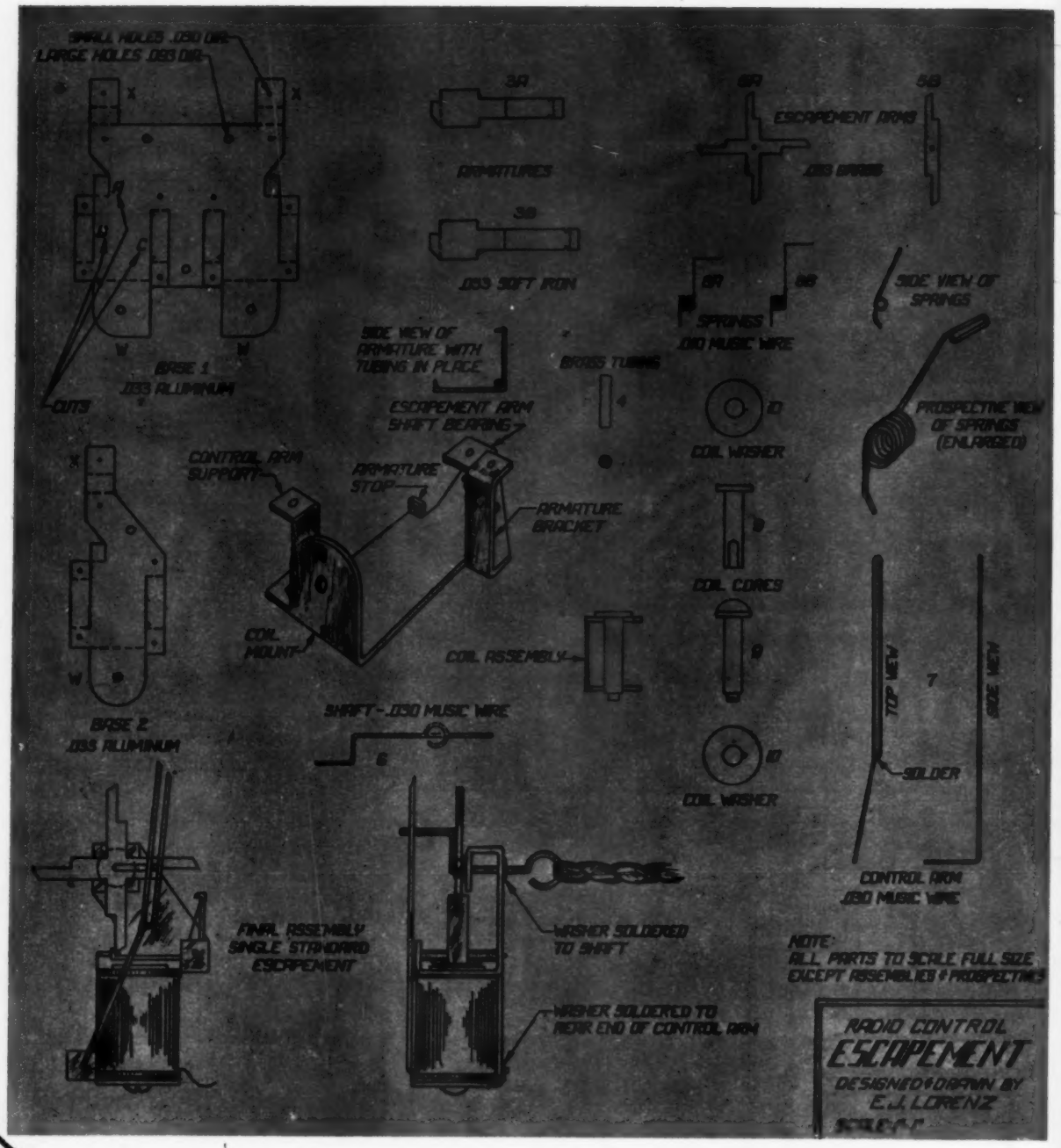
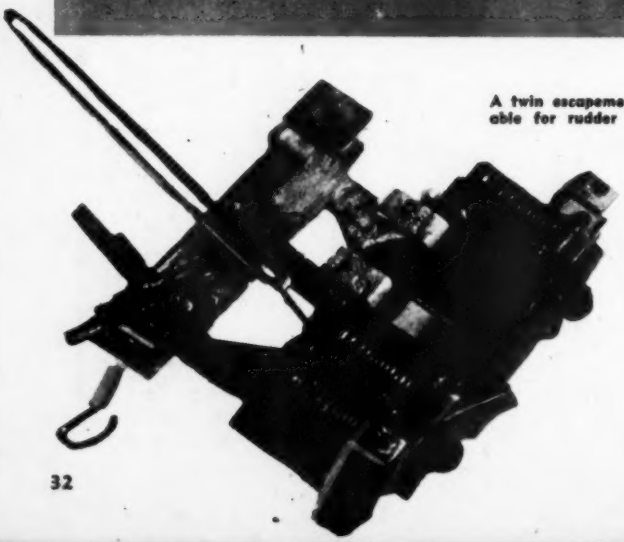


AIR AGE INC., 551 FIFTH AVE., NEW YORK 17, N.Y.
GENERAL ARRANGEMENTS
FRENCH "S.P.A.D." FIGHTER
SCALE: 1/8"=1'0"
DATE:
DRAWN BY...
W. A. WYLAM
S-XIII C.1
MODEL "C" (200 H.P.) & MODEL "E" (220 H.P.) HISPANO-SUIZA ENGINES
LEADING EDGE-PROPELLER HUB
COWL CUT-OUT-MACHINE GUN TROUGH
FIXED .30 CAL. MARLIN MACHINE GUNS
WING MOUNTING LUGS
REMOVABLE ACCESS PANEL
SEMI-FIXED COWLS
FIXED WINDSHIELD
LEATHER PADDING
PLYWOOD PANEL
PLAN VIEW-RES. FUEL TANK
RESERVE FUEL TANK
FRONT VIEW-RES. TANK
METAL
FABRIC
PHOTO
SHUTTER VANES
SHUTTER PIVOT RODS
RADIATOR OUTLINE
SCREEN (OPTIONAL)
MINOR CHANGES FOR LATE S.13 MODELS
OPTIONAL MANIFOLD
SLIDING ACCESS PANEL
FIXED EMPTY SHELL CHUTE
VERTICAL STABILIZER BRACE WIRE
ELEVATOR HINGE
FABRIC COVER
PLYWOOD PANEL
CAMERA APERTURE
TAIL LIFT HANDLE
OPTIONAL MANIFOLD
MANIFOLD COUPLING
FAIRED HEADREST
ENGINE MANIFOLD
UPPER WING LEADING EDGE
FOOT STEP
FLAME DAMPERS
FIXED RADIATOR COWL
FUEL TANK COVER CAP
HINGED SEAT
SEAT CUSHION
STEP PLATE
TANK SUPPORT BAND
TANK SUMP
MAIN FUEL TANK
COOLING AIR OUTLET-OIL COOLER-ON LATE
OIL SUMP PLUG ACCESS
SEMI-FIXED COWL
REMOVABLE PANEL
DRAIN PLUG-RADIATOR
BOTTOM VIEW
RED RED
BLUE WHITE
WHITE COBALT BLUE
U.S.A. FRENCH
LATE S-13 LOWER WING PANEL DESIGN-NO CHANGE ON UPPER WING.
NOTES: FOR DETAILS ON INBOARD & OUTBOARD WING STRUTS, SEE MARCH '46 M.A.N.; FOR VICKERS GUN, SEE APRIL '46 M.A.N.; AND FOR HISPANO-SUIZA DETAILS, SEE SEPT. '45 MODEL AIRPLANE NEWS.
FUEL TANK SUMP
REMOVABLE COWL
FIXED .30 CAL. VICKERS M.G.s
MACHINE GUN TROUGH
RING GUN SIGHT & MOUNT
RADIATOR COVER CAP
PET COCK-FUEL LINE
ANCHOR PLATES
PORT SIDE WING FUEL TANK
COOLING AIR OUTLETS (VICKERS GUNS)
FUEL TANK COVER CAP
RELIEF VALVE-EXPANSION TANK
FIXED WINDSHIELD
FIXED CAM HOUSING COWL
AILERON CRANK & OPENING
PIVOTED BELL CRANK
BELL CRANK SUPPORT
SINGLE LANDING WIRES
RIGID INBOARD STRUTS
TURNBUCKLE ASSEMBLY
BRASS REINFORCEMENT BANDS
ANCHOR PLATES
PIVOT POINT
BELL CRANK
TURNBUCKLE
SHUTTER VANES
SHUTTER PIVOT RODS
DRAIN SPACE
TREAD
5'0"
FIXED .30 CAL. VICKERS M.G.s
RING GUN SIGHT
RADIATOR COVER CAP
AIR INLETS
RELIEF VALVE
FUEL TANK COVER CAP
FUEL TANK SUMP
PEEP SIGHT
ANCHOR PLATES
AILERON CRANK
BLUE NO. WITH WHITE TRIM (U.S.A.)
VERTICAL STAB. BRACE WIRE
SLIDING INSPECTION DOOR
RUDDER CONTROL HORN
BLUE
WHITE
RED
TYPE NUMBER
SQUADRON NO.
ENGINE H.P.
PAYLOAD DATA
ENGINE NAME
RED
WHITE
COBALT BLUE
MAYER III
15
PHOTO
METAL
BRASS SPEC. PLATE
SLIDING PANEL
MANIFOLD COUPLING
EMPTY SHELL CHUTE
FUEL TANK SUMP
FOOT STEP
BRASS SPEC. PLATE
FUEL TANK COVER CAP
STEP PLATE
DRAIN PLUG (AIR HOSE CONN.)
TAIL LIFT
HICKORY TAILSKID
FIXED PLYWOOD PANEL
HORIZONTAL STAB. BRACE
METAL STRIP
135TH SQUADRON (U.S.A.)
LATE AMERICAN RUDDER
FRENCH AND EARLY AMERICAN RUDDER MARKINGS-FRENCH RUDDER COLOR BARS SHOWN-ALL LETTERING BLACK.
NOTES:
SEE APRIL '46 M.A.N. FOR CAMOUFLAGE COLOR SCHEME ON S.7s-SAME SYSTEM USED ON S.13s.
PROPELLER DIA.


5 Equal Spaces
8 Equal Spaces
4 Equal Spaces
6"R - All Scallops
Rear Spar - Upper Wing
Front Spar - Upper Wing
Rear Spar - Lower Wing
Front Spar - Lower Wing
Late S-13 C.1 Type
26'5" Spar Upper Wing & Late S-13 Lower Wing
25'9" Spar Lower Wing
Horizontal Thruset
Airplane ℄
Axle ℄
Straight From "E" To "N"
Propeller Layout
All Squares = 2"
Cabane Structure
20'8" Overall
Straight From "F" To "N"
Parallel To Thruset ℄
Straight From "N" To "N"
A B C D E F G G H J K L M N
+1° Incidence
+2° Incidence
Spar "S-13 C.1" Airfoil Section
Chord
J K L M N
E F G H
A B C D
AIR AGE INC., 551 FIFTH AVE., NEW YORK 17, N.Y.
SCALE: 1/8" = 1'-0"
DATE:
DRAWN BY ... W.A.WYLAM
Layout Data & Details
French "S.R.A.D." Fighter
S-XIII C.1

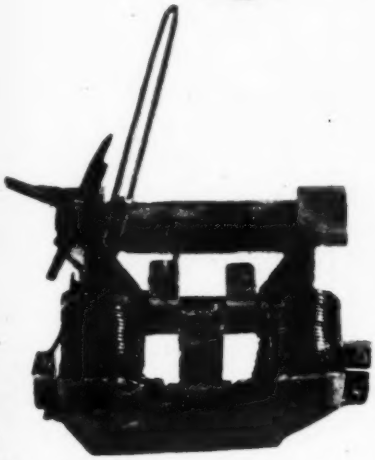




A twin escapement unit which is suitable for rudder and elevator control

R.C.

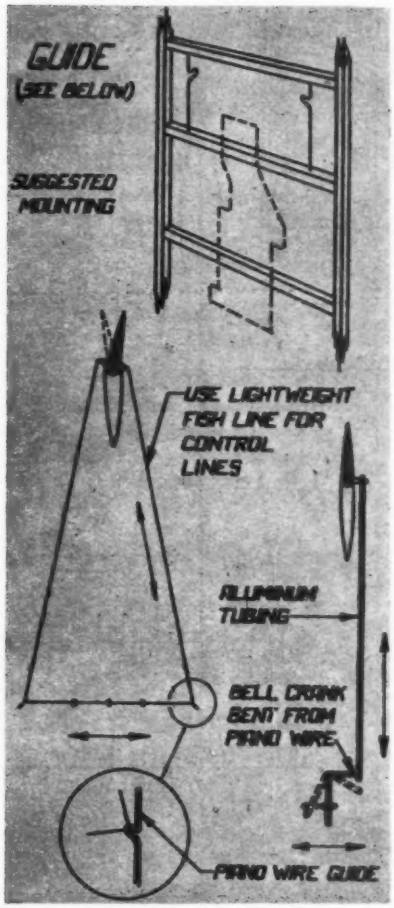
Details are provided here for constructing several ultra-lightweight escapements for your radio control model



(Top) Tiny single escapement unit usable for control surface actuation

(Center) Moving parts have been left off one side in order to show construction

(Bottom) A different angle of the single unit reveals further details



Suggestions for mounting and connecting escapement to the rudder

Escapements

by E. J. LORENZ

WITH wartime restrictions now lifted, radio controlled models are beginning to dominate the scene again. If you are one of the many followers of this interesting and fast developing phase of model building, you are probably anxious to get started on a new radio controlled plane, or make improvements on one you already have built.

In this article are plans for a newly developed escapement for radio control, designed especially for those of you who are interested in cutting down the weight or size of your model. It is a simple, lightweight but foolproof unit to actuate the rudder or elevator or other controls. Designed primarily for the Class A radio controlled model, this escapement is easily adaptable for use in planes as small as 38 inches or as large as 7 feet. It weighs but .35 oz. and operates on 1½-3 volts. All the materials are readily available to the average model builder or can be obtained at any small radio shop.

The tools necessary are: a small fine-cut file; tin snips, or chisel and hammer; hand drill with .030" and .093" drills; small long nose pliers; small vise. The materials needed are: a piece of .033 aluminum; small piece of brass and one of soft iron, approximately .033 thick; ⅛" soft iron rivet ½" long or a piece of soft iron from which to turn the core piece; music wire size .010 and .030; several small washers; small piece of 1/32" fibre or plywood; and about 10 feet of No. 26 enameled copper wire. The plans are self explanatory, but read the instructions carefully as they explain the simplest and best way to make each part.

Plans are given for four different types, single and double escapements with either standard or self neutralizing action. The double unit is merely a consolidation of two single units on one base. The standard action escapement operates in the following manner: one impulse will take the control arm from neutral to either left or right; a second impulse is needed to return the arm to neutral; a third impulse will then place it in the right or left position; and a fourth impulse completes the cycle and returns the arm to neutral. In the self neutralizing escapement, one impulse will place the arm in either a left or right position and it will remain there until the impulse is removed. The arm will then automatically return to neutral and be ready to follow thru in the opposite direction upon receipt of the next impulse. The advantage of the standard action escapement is that it takes less current to operate inasmuch as no current is used while the arm is in a left or right position. The advantage of the self neutralizing unit is that if the receiver or transmitter should become inoperative, the control arm automatically returns to neutral. Also, there is less confusion in determining how many impulses will be needed to get from one position to another.

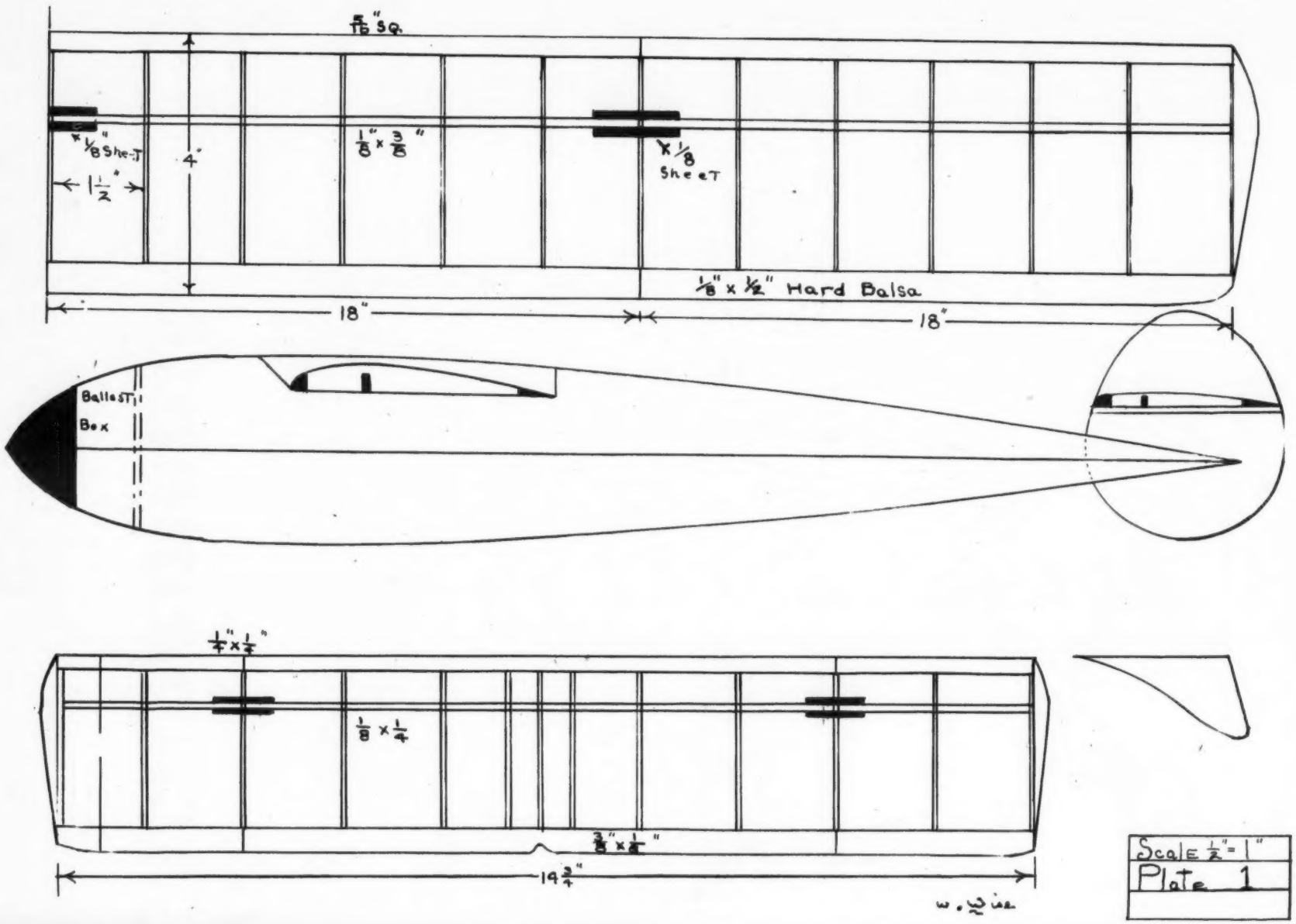
The base (Nos. 1 or 2) is first laid out on the .033 aluminum by tracing the full size pattern. Cut it out with tin snips or a chisel and hammer. After it is cut, hammer it flat and file down any rough edges. Cuts A, B and C are made with a single edge razor blade, hammered along the lines. This is to assure as narrow a cut as possible since we want to keep the dimensions to a minimum. After these cuts are made, flatten the piece out again and then mark the lines where it is to be bent.

All bends are 90 degree angles. First bend end piece W, the coil mount by placing it in a vise.

Follow with the opposite end piece X. The ⅛" space between X and the main base is formed over a ⅛" thick piece of metal such as the edge of a file. The remaining bends for the armature bracket and the control arm support are made with long nose pliers. After all bends are made, check the piece to see that everything is lined up at right angles. Next, drill holes as noted on the full size plan. Care should be taken to see that these holes are drilled perpendicular to the base, preferably in a drill press. This completes the base.

The armature (either 3A or 3B) is made next from .033 soft iron. Solecore iron is the best although a piece cut from a transformer core, obtainable at a radio shop, may be used. The making of this piece is self explanatory from the drawing, 3B being used for the self neutralizing unit. When this is completed, the small piece of brass tubing (4) is soldered in place. Make sure this is at right angles to both arms of the armature. This length of tubing should make an easy fit between

(*Turn to page* 89)


5/16" Sq.
1/8" Sheet
4"
1 1/2"
1/8" x 3/8"
1/8 Sheet
1/8" x 1/2" Hard Balsa
18"
18"
Ballast Box
1/4" x 1/4"
1/8 x 1/4
3/8" x 1/8"
19 3/4"
Scale 1/2" = 1"
Plate 1

by WARREN WISE

This towline glider combines the simplest construction with fine performance

Towline Glider

BEFORE the war the towline glider was relatively unknown in the contest field, but with the scarcity of materials it gained a new importance. During this period it became such a necessary part of model building that it is evident it will never be dislodged from its rightful place. It has become more than a substitute for power models; it combines the thrill of power flight without the need of investing a small fortune.

This towline glider combines the simplest type of construction with excellent performance. It was completed the night before a contest and was flown to victory the next day. This gives you an idea of the possibilities of the design. The ship has an extremely flat glide and can be flown without having to chase it all over the countryside to recover her once she is on her way.

The wing and stabilizer plan should be drawn to the required size. The plans are one-half size so little difficulty should be encountered.

FUSELAGE—Cut the fuselage sides to the proper size as indicated on the plans and cement them as indicated on the fuselage detail. They may be held in place by wrapping rubber thread around the fuselage. Be careful that an ample supply of cement is applied to the fuselage seams. After the fuselage has been completed, form the nose block to the proper shape. Then sand the entire fuselage to the finished form. The fairing which is to be attached to the uppersurface of the wing should now be cut from the fuselage. Be careful that the exact angle of incidence is cut in the fuselage. The slot which is to house the rudder should be cut along two seams directly opposite each other. It should be 2" long and 1/8" wide.

WING, STABILIZER AND RUDDER—Construction of the wing and stabilizer are as simple as can be imagined. 25 wing ribs are required and the foil is a Clark Y. The one thing you must watch is the notches for the center spars. If they are oversized it will cause extreme warpage. The leading and trailing edges may be roughly shaped before cementing them in place.

After the wing outline is complete, glue on the tips at each end of the wing, making sure the tips are flush with the bottom surface. Cut the wing into four sections as indicated on the plans. The wing dihedral should be put in by blocking it up to the correct angle and gluing. After this has had ample time to dry, glue the dihedral reinforcements in place. Don't spare the glue! The finished product should then be sanded thoroughly to provide a good surface for covering.

The stabilizer is constructed in much the same way as the wing except that there are only two breaks for dihedral. The tip is constructed in exactly the same manner, the dihedral under each tip being 1¼".

The rudder is built of ⅛" medium sheet. A streamline airfoil should be sanded in as is shown on the plan. Cement the stabilizer mount to the lower portion of the rudder very strongly. Take special care to get the mount at perfect right angles to the rudder. A dowel 1/16" in diameter can be placed directly below the mount in the rudder. The smaller rudders are constructed of 1/16" sheet balsa and cemented to the last rib of the stabilizer. They should be at right angles to the outer portion of the stabilizer. To cement the rudders securely to the stabilizer stick a pin into the rib to which it is to be cemented. This increases the glue area, thus procuring a stronger joint.

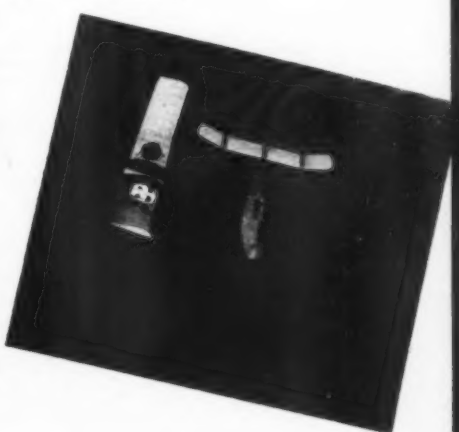
COVERING—The ship is now ready to cover. This is where a great deal of care should be exercised. Cut the tissue to approximately the correct size. Cover the wing and stabilizer in the usual manner. Apply three or four coats of fairly thin dope. The fuselage and rudders should also be covered with tissue; this may be done by laying the tissue on the surface and applying dope over it. The dope will soak through to the surface below. This method gives a smooth papering job.

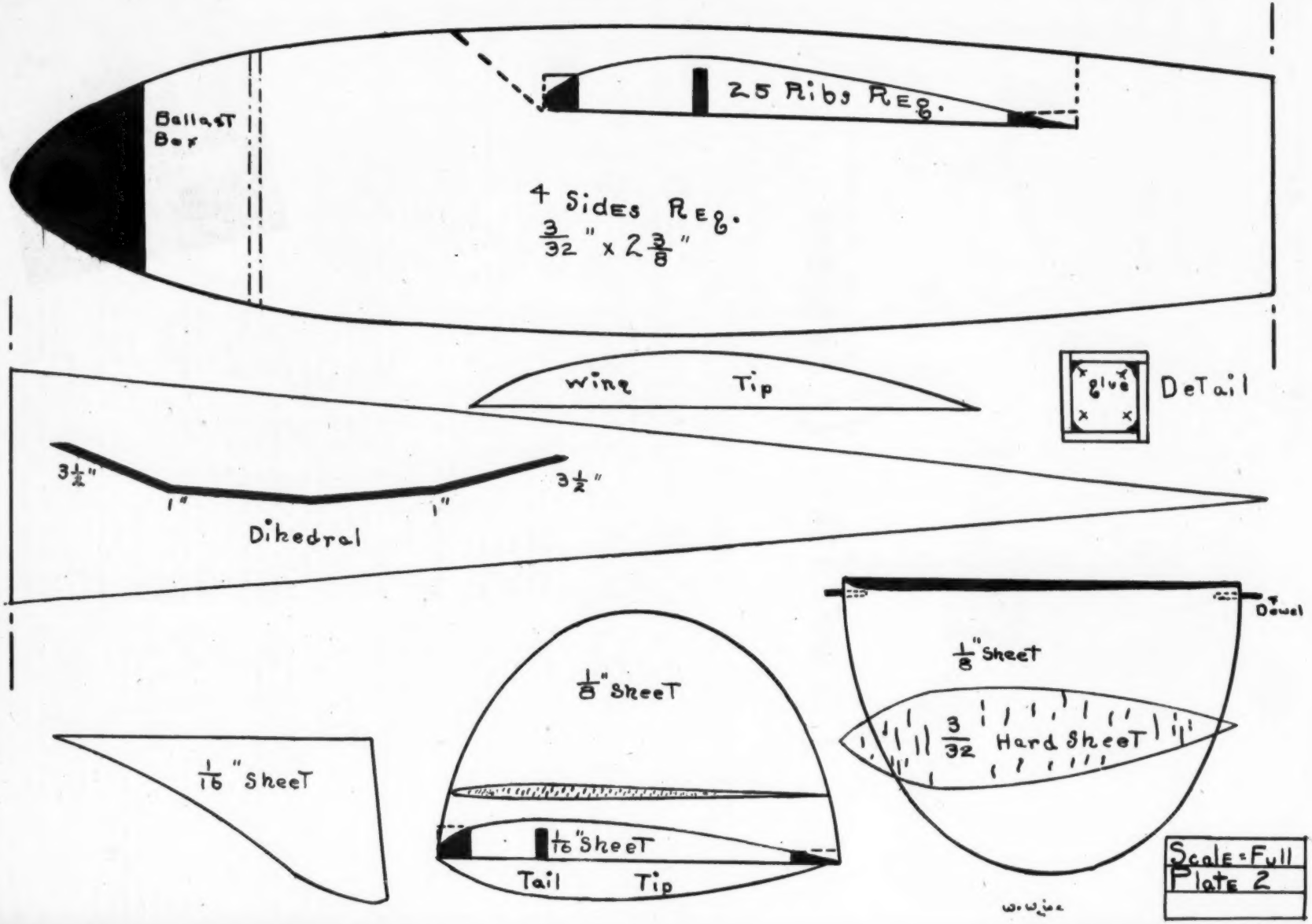
FLYING—Pick a day that is fairly calm. Hand glide the ship, adding weight as needed until the glide is flat. Place the towline on the hook which should be located directly below the center spar about one inch on the right side, and start to tow the model. It should climb rather steeply in almost a perfectly straight course. The glide should be to the right in about fifty-foot circles. Try to obtain the flattest glide possible.

This model should give every builder a feeling of satisfaction due to its simple construction and fine flying characteristics since, as mentioned above, it has proved itself in competition.

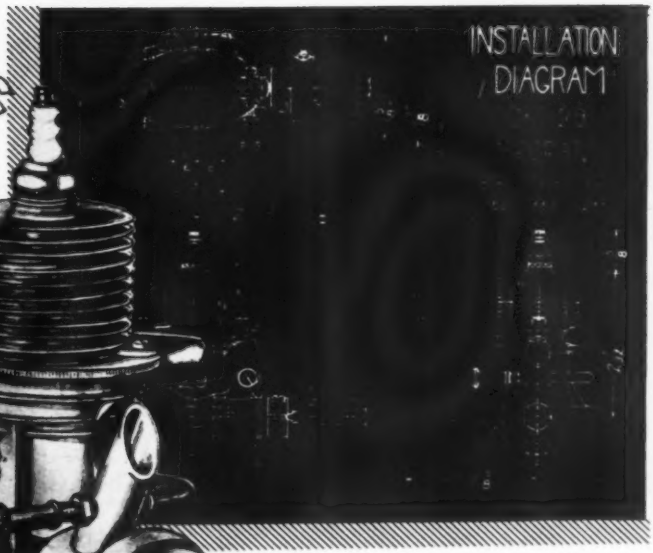
LIST OF MATERIALS

4 sheets of medium balsa 3/32" x 2-3/8" x 19"
1 sheet of medium balsa 1/8" x 3" x 12"
1 strip of medium balsa 1/8" x 1/2" x 36"
2 strips of hard balsa 1/8" x 3/8" x 36"
1 strip of medium balsa 5/16" x 5/16" x 36"
1 strip of medium balsa 1/4" x 1/4" x 16"
1 sheet of medium balsa 1/16" x 2" x 36"
1 block of hard balsa 1-1/2" x 1-1/2" x 1-1/2"
1 ten cent tube of cement
2 sheets of Jap tissue
1 1/4 pint of clear dope




Ballast Bar
25 Ribs Req.
4 Sides Req.
3/32" x 2 3/8"
wing Tip
Detail
glue
3 1/2"
1"
1"
3 1/2"
Dihedral
1/8" Sheet
Dowel
1/8" Sheet
3/32 Hard Sheet
1/16" Sheet
1/16" Sheet
Tail Tip
Scale = Full
Plate 2

NEW OK 29



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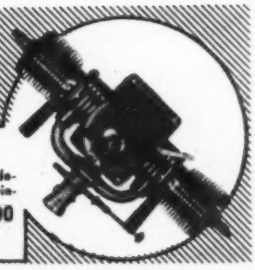

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WORLD WAR I

Further details of the strong points and faults of the famous Albatros Fighters are featured in this fascinating story

by ROBERT CAMPBELL

This Albatros D.IV has D.III wings and tail and round fuselage. It never went into production.

The Albatros D.III, a graceful ship but one that was very fragile, shown here fresh from factory.

Here we see the famous Von Richthofen taking off in his red Albatros — he didn't care much for them.

PART 3

IN THE history of aerial warfare during World War I, the Albatros D.III probably shares the limelight with the Fokker D.VII as the typical German pursuit of that day. Wartime literature abounds with mention of the D.III both in accounts of battles with them from the Allied standpoint and as a fighting ship from the German point of view. The image of the "V" strutted D.III rings a nostalgic memory to those lucky survivors of "Bloody April," 1917 when the German flying service played havoc with the Allies. The spring of 1917 was a high spot in the career of Germany's W.W.I. air arm, a period in which the Albatros D.III was kingpin.

Although not a spectacular performer, the D.III was a good all around pursuit that served at the front until the spring of 1918 when it was retired to rear areas for use as a pursuit trainer. Because the D.III was built in larger numbers than any of its predecessors, considerably more detail regarding its construction and performance is available through research and official records. Since the D.III follows closely its ancestors in most details of construction, only the noteworthy differences will be reported in the following discussion.

Design Considerations

While it is generally recognized that the reasons for advancing the D.III design were to increase performance of a type without the research and expense involved in developing a new plane, detail improvements sought were: an improved rate of climb, better maneuverability and higher speed. The first two details were attempted through an increased aspect ratio derived by increasing the span and reducing the chord of both wings. Factory specifications thus list the D.III upper wingspan as 9 meters; lower span, 8.90 meters; and respective chords as 1.50 meters and 1.10 meters. Net result was a decrease in wing area to 21.13 square meters.

Increased speed was hoped for by a reduction in drag through simplified interplane bracing. Following Nieuport practice, a single "V" shaped strut was in-

(*Turn to page* 42)

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Neptune

(Continued from page 21)

Fig. 14. Wings fitted in place but pylon nose section not yet installed. Note rubberbands on clips rear of motor unit

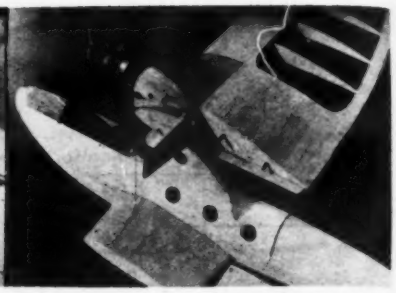


Fig. 15. One wing has been removed to show locating pins. The wing platform and pylon spar are also clearly visible here

Fig. 16. Wire clips are fastened to each wing half at front and at trailing edges to hold rubberbands

Fig. 17. Almost ready for covering. The model's graceful lines are evident even in this incompleted state

ment of the outer riblet so that it lies flat against the inner face of wing rib 3.

The wing is now removed and the next step is to cut out the slot marked with the template on the main spar and outer riblet and insert the 3/16" plywood tongue, gluing freely inside to prevent it from pulling loose. Finally cover the centersection spar and riblets with 1/16" sheet, top and bottom, slip the wings onto their respective locating tongues and hold together with elastic bands. They should fit snugly around the centersection which can be sanded to an exact flush fit with the wing.

EMPENNAGE—This is quite straightforward and construction should be obvious from the plans. The only noteworthy points are that both fin and stabilizer are sparless partially-stressed-skin structures and are thus very light. The stabilizer has the same dihedral as the main plane thus helping to avoid too large and ugly a fin. Trimming tab is positively operated by a brass bolt against tension of a small rubberband and makes for consistent settings, yet the whole empennage is "knock-off," which facilitates drying in the airing cupboard after a wet day's flying.

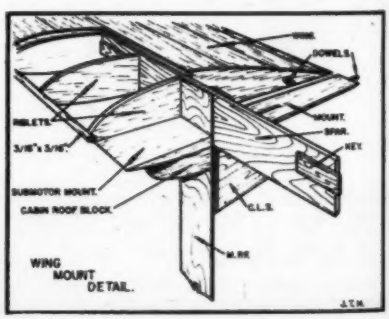
MISCELLANEOUS—According to weight of engine and batteries (note homemade wet storage battery in photo 11) it may be necessary to add up to 2 oz. of lead ballast in the nose block. A hole for this is easily drilled and plugged with a cork.

Be very careful to insulate coil and high tension lead. The latter is best insulated with bakelite tubing through the wall of the engine nacelle as balsa soaks up moisture very readily and becomes a good conductor.

The whole machine is silk covered, though doubtless planefilm can be used—I have not yet met American Silkspan so cannot vouch for its suitability. The important point to note in flying boat work is the unsatisfactory result of using photopaste as an adhesive. Sooner or later it invariably gets damp and then the covering comes loose and the dope cracks. The hull bottom is very thickly coated with full size glider dope, the silk being actually stuck on with the second or third coat. It is then coated again and finally color doped. The original model is sprayed all over with silver cellulose dope, the hull bottom being scarlet, and the effect is very pleasing.

OPERATION—It is absolutely essential to get the glide right and nearly straight before attempting power flights. If possible glide from a good height into some harbor or river. I test glide from a 15 ft. dock wall. Despite her light loading of little more than 12 oz. sq. ft., *Neptune* is fast on the glide; don't be scared of a good shove—she is crashproof on water!

(Turn to page 42)



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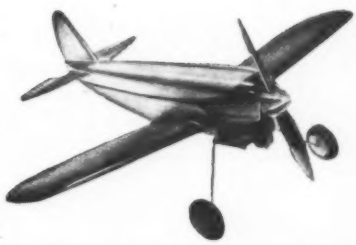

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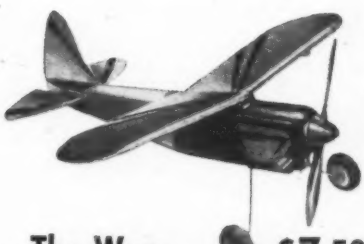

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Starting engines over the gunwale of a boat with the model on the water is just about impossible. Rest the model on your knees while sitting in a boat *well offshore*. Start up and try a few hand launches first with spark retarded to get an idea of torque effects. Offset the engine until nearly straight power flight is obtained at half throttle. Then give her the gun and she should climb and circle with the torque. Make only minor adjustment with the trimming tab or this will upset the straight glide. When the flight circle under full throttle is nice and big (say not less than 100 yd. in diameter) she will hold to a straight course into wind when taking off water. Now chaps, get weaving and happy takeoffs!

World War I

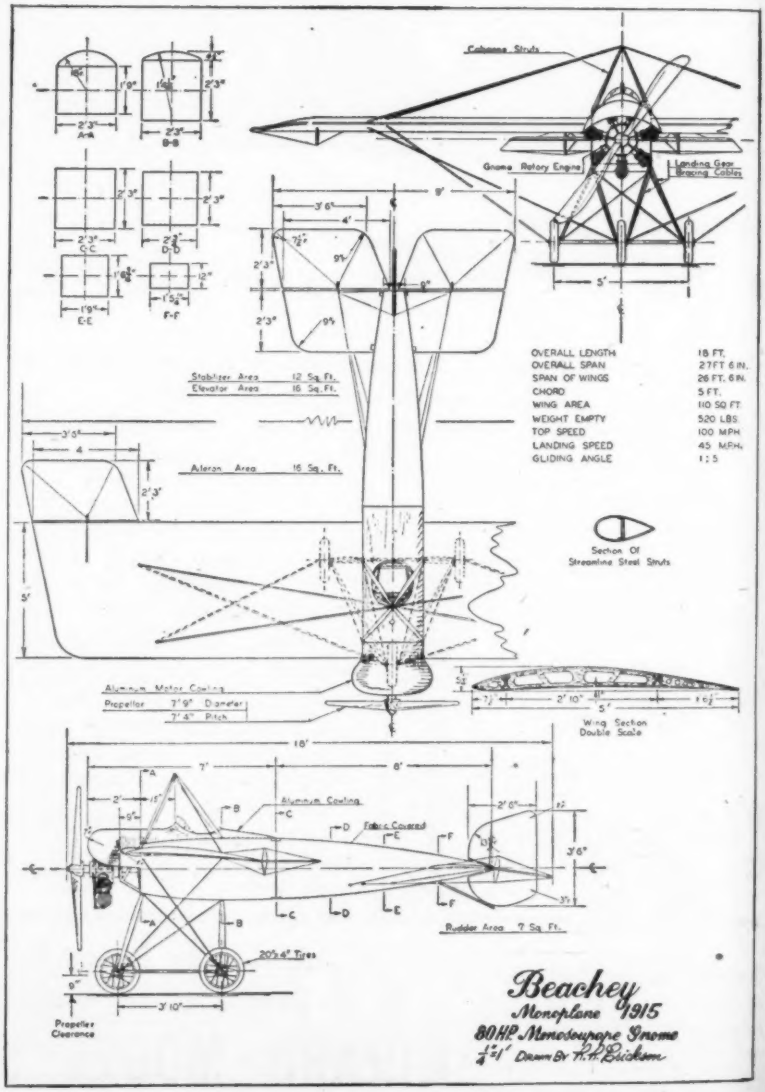
(*Continued from page* 38)

corporated to replace the wire braced parallel struts of the D.I and D.II. Paradoxically, the hoped for speed increase did not materialize in the D.III, and after the ship was in full production and at the front in numbers, the failures attributed to the flimsy construction were many.

Manfred von Richthofen, Germany's greatest World War I ace, left one of the best accounts of this failure in a report addressed to the Engineering Department, Berlin, Aldershoff, dated April 9, 1917. This report reads, in part:

"On April 8, 1917, Sergeant Festner's machine, Albatros D.III 2-23-16, broke its lower left wing at an altitude of 13,000 feet without previous straining. From the second rib up to the V strut, the lower surface was folded upward. Cause: breaking of all ribs . . . entirely near the forward part of the wing where the factory had applied special rib supporting braces."

Still incensed over the incident, Richthofen on April 11 wrote a scathing treatise on the quality of planes then furnished to the German aces. He commented that the ideal pursuit plane must maintain altitude during steep turns or in slow rolls ". . . . but this is not the case with the Albatros D.III. With the Albatros the ailerons are not quite suffi-



cient." And, ". . . . a pursuit plane must be able to stand the strain of diving down 3,000 feet. The Albatros does not do this always."

Wing Construction

Weak winged, the Albatros D.III was seldom dived below 500 ft. altitude by its cautious pilots, and many Allied airmen, taking advantage of this weakness, escaped to fight and fly again by merely hitting the deck. The upper wing was made in one piece and consisted of two box type main spars with 27 plywood ribs capstripped with pine. Eight steel tube compression members were placed between the spars at equal distances and the whole structure braced internally with steel piano wire. The front spar centerline was 4½" from the leading edge, with 28" separating the two spars, measured from their centers. The trailing edge was found 23½" from centerline of rear spar.

Built in right- and left-hand panels, the lower wing carried its ribs on the single spar with the leading edge 15½" and the trailing 27½" from the spar's center. Three compression members in each panel supported leading and trailing edges from the main beam.

Empennage of the Albatros D.III was a duplicate of that used on the D.I and D.II, composed of wood framed and three-ply covered fixed surfaces with steel tube framed and fabric covered elevator and rudder.

Except for interior refinements the D.III fuselage, too, was identical to that of the D.I and D.II. Nominally, German specifications give the overall length of the D.III as 7.33 meters, although the various spinners fitted to different propellers provided figures of 7.43 meters and 7.20 meters for the same dimension. Pilot comfort was given some consideration in the D.III where it had been either ignored or overlooked in previous models. Adjustable fore and aft only on the ground, the pilot seat was mounted on two pieces of wood equipped with holes at intervals to which the seat could be bolted.

The engine was, of course, the Mercedes 160 hp model equipped with two Bosch ignition magnetos and a third magneto for starting. Water was cooled by a radiator located in the upper wing on the right-hand side of the centersection. Shaped to conform generally to the airfoil section, the radiator was equipped with a filter projecting about 8" above the surface and provided with a small cone pointing towards the front to give air pressure to water in the system.

Two gasoline tanks one above the other were located to the rear of the engine. The lower tank, main fuel supply, contained 19 gallons while the upper reserve tank held only 5 gallons. An oil tank of approximately 2 gallons capacity was located on the left side of the engine.

Two Spandan machine guns were mounted on the upper cowl in front of the pilot, firing through the propeller by means of a direct flexible drive interrupter gear. Empty shells were passed through tubes on each side of the fuselage to the rear of the engine to the bottom of the fuselage.

Performance and Loadings

Usually believed to have been capable of quite high speeds because of its streamlined appearance, the Albatros D.III will probably be disappointing to many World War I enthusiasts in point of performance. Its top speed at 1,000 meters altitude, according to official German flight data, was an even 175 kilometers per hour, or ap-

(*Turn to page* 46)

proximately 110 mph. This speed dropped off to 153 kph at 3,000 meters and to 149 kph at 4,000 meters. Service ceiling for the D.III was 5,500 meters, or roughly 18,500 ft. Rate of climb, too, probably will be disappointing. The D.III required 2 minutes flat to reach 500 meters, 8 min. 50 sec. to reach 2,000 meters, and 24 min. 30 sec. to attain 4,000 meters altitude.

This performance was based on a normally loaded ship, fully armed, gassed and ready for an operational patrol. Weight empty was listed as 684 kilograms. Fuel and oil accounted for 90 kg., useful load was 150 kg., to give a total gross weight of 924 kg. Weight per hp was officially quoted as 5.3 kg., while wing loading was 43.5 kg. per square meter of supporting surface.

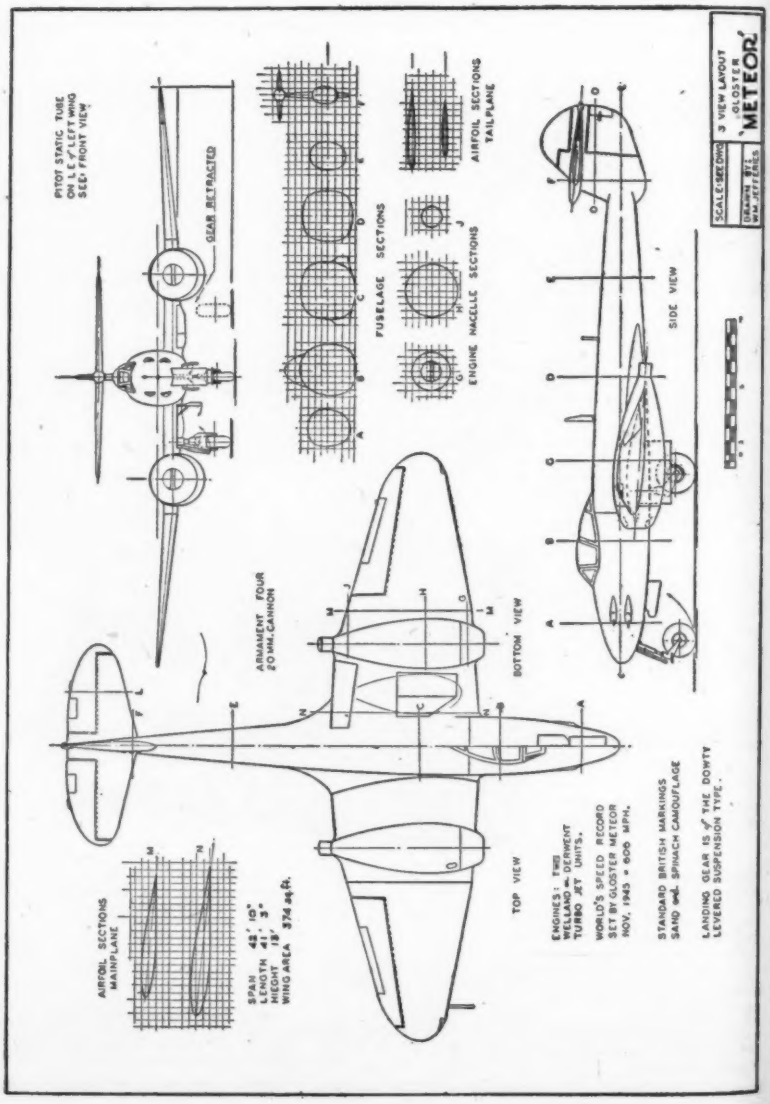
Albatros D.IV

Since it was merely a step in the evolution of the Albatros fighter series, the D.IV is included only for historical reasons. Never put in production, test models were built late in 1916 and failed to indicate any advantage over the D.III. But they paved the way for the D.V. pursuit which will be described in a later issue. The D.IV was interesting, however, in that it represented a further refinement of lines in an attempt to squeeze still more performance out of an existing basic design. Main point of difference with the D.III was the round sectioned fuselage. Wings, empennage, landing gear and armament were identical to such details of the D.III. The fact that it was not considered worthy of production indicates it lacked the improved characteristics hoped for when it was constructed.

NOTE: Generally, in each issue, we have had Robert Campbell's story cover the same ship as William Wylam's Masterplans. In this issue, however, Mr. Campbell has given further Albatros details, since the Spad 13 was described in our May 1945 issue.

PHOTO CREDITS

Page	
2	*Above*—Douglas Aircraft *Below*—Consolidated Vultee
23	*All*—North American Aviation
38	*All*—Robert C. Hare



Design Forum

(*Continued from page 20*)

is as efficient as the wing of an ordinary airplane, only 1/3 of the area of which is effective for high speed, the remainder producing only drag. Though the sweptback outer wing panels of this tailless plane are apparently ineffective at high speed they serve a vital purpose for landing. In fact, this type of wing should be more efficient for landing than a straight span wing although little research has been carried on to prove this. Common sense, however, based on knowledge of general aerodynamics can show the possibilities of this wing.

When landing at comparatively slow speeds the airflow drifts toward the wingtips. In straight wings this results in tip spill and reduces efficiency, that part of the wing near the tips lifting much less than the inner part. On this sweptback wing, however, though there is drift of air towards the tips this drift, due to the sweepback, will be parallel to the span which is approximately 45° to the fuselage. So airflow that would commonly spill off the tip and trailing edge of the normal wing flows outward along the length of these sweptback panels, which creates the effect of increased wing chord length.

Data from the wind tunnel shows that wings of small span but large chord give high lift coefficients at high angles of attack. In fact the maximum angle of attack of a circular plate for instance is 30°—that is, this angle can be 30° before stalling takes place. The ordinary wing stalls at 16°. We also find that the lift coefficient is approximately proportional to the angle of attack.

It is reasonable to expect that Mr. McKee's form of wing will have similar or better characteristics for landing. Consequently a very high lift coefficient for landing is available. Stated in brief, we have a wing with span reduced because of sweepback so that resistance is low for high speed with surface so disposed that lift is high for landing speeds. The vertical wing tip plates also improve the wing characteristics by preventing tip spill—that is, the air is prevented from spilling off the wing tips by these plates, thereby producing a less turbulent flow over the tips. This can only result in an increased lift and reduced drag.

Great foresight is shown also in the longitudinal or lengthwise contour of the fuselage which takes the form of a high speed laminar flow wing instead of the orthodox streamline. The laminar flow section incurs far less drag at sonic speeds than orthodox streamlined sections. The use of propellers and jets is excellent, providing efficient power both for takeoff and high speed. Jet propulsion is very inefficient at slow speeds. The propellers will provide power for this condition. At high speeds and high altitudes the jets will deliver the greater percentage of power.

Disposition of the engines and nacelles is excellent, being located at the point of sweepback, the centersection being perpendicular to flight. This arrangement not only provides proper clearance for the propeller but forms a centersection which will give maximum lift at high speed. In this case about 90% of the total lift would be carried by the centersection. The control surfaces located at the wingtips will be extremely effective because of their distance rearward from c.g. With gun turrets at rear of the fuselage top and bottom, and fixed guns in the nose or for-

ward part of the belly, the ship would not only be able to attack effectively but would be protected from nearly every angle from attack by other planes.

The most difficult problem in such a craft is to proportion it so that c.g. coincides with the center of pressure; in other words, so that the airplane's weight and lift provide proper balance. Mr. McKee has done this to perfection. Center of pressure of this wing will probably be about 60% rearward of the leading edge of the centersection. The c.g. will probably be located at this point or slightly in front of it, which is normal practice.

Mr. McKee has not only laid out the proportions as well as possible, but his rendering of the drawing is that of a finished artist. We can expect with reasonable certainty to see a plane similar to this design traveling the airways in the near future.

* *

Another excellent design has been submitted by Sears B. McCorrison, Fig. 2. Possibly some fans would not give this design a second glance because it is orthodox in all its lines and has no unusual feature. However, it requires real genius to take the commonplace and create an efficient product.

It is a design for a four place twin motored civilian airplane. It should be very efficient because of the comparatively small amount of structure used. The low wing type contributes to this greatly because, unlike high wing types, the landing and wing stresses do not have to be carried through the uprights of the cabin structure. Consequently, the cabin structure above the wing can be simple and of much less weight. Twin engines also help to reduce the high stresses produced by a heavy engine at the wing center. This has the same effect as a partially distributed load on a beam as compared with a concentrated one at the center. It reduces the weight of the wing.

Landing stresses created by engines, wings, passengers and general structure are transmitted almost directly to the landing gear through the smallest amount of structure. The twin 85 hp engines insure reliability. Flight can be continued in case of failure of one engine. Visibility is unimpaired by engine and cowling forward of the passenger compartment. The landing gear is retractable thereby increasing speed.

An unusual feature lies in the protrusion of the lower part of the wheels below the wing upon which the airplane can land if the retractable gear becomes jammed.

The ship is to be made of bonded plywood or with monocoque style fuselage, and metal wing framework covered with cloth. Mr. McCorrison is worried about the warping tendencies of bonded plywood so he gives the alternate type of construction. Warpage occurred in early forms of plywood construction, but with new types of molded plastic and fibre glass construction, little warpage occurs and great strength is provided with little weight.

We note that Mr. McCorrison has provided a dihedral stabilizer and wondered why this complication is included. A straight stabilizer would be just as efficient. Sometimes stabilizers are dihedral to provide more ground clearance but apparently in this case this is not necessary. In the front view the stabilizer dihedral is shown the same as the wing. This is never good practice because equal dihedral on tail and wing create lateral swinging moments which are in tune with

one another. Dihedral of different values create swinging moments of different periods and therefore the tendency to oscilate is reduced. This point has seldom been considered in design but the effects of this combination have been proved on a number of occasions in the past.

* *

Mr. R. L. Clough Jr., 394 Whalley Ave., New Haven, Conn. sends us a fantastic design for a pylon model. Believe it or not—it has no wings. It is supposed to rise from the ground by the lifting effect of the upward component of the propeller thrust and the stabilizer. In theory this is actually possible. The problem resolves itself into creating a design that provides a stable force combination with various positions of the airplane during flight.

Fig. 3 shows a side view of the wingless model ready to take off. The front view is illustrated in Fig. 3-A. Fig. 4 shows the vertical panels extended in horizontal position to serve as wings for landing. Mr. Clough's theory is that "the propeller provides lift, the V tail depresses the aft part of fuselage to maintain slight upthrust, the pylon cancels engine torque in addition to raising center of resistance, the pylon opens into wings for landing, the elevators are controlled in the usual manner through the guidelines. A three blade large area propeller with high pitch is specified."

Now let us see what this plane will do. From the normal ground position the plane starts forward, and begins to rise as in Fig. 5 because the spinning propeller generates a lift component *L* and a horizontal component *P*. We will assume that component *L* is greater than the weight *W* of the airplane, acting at c.g. Consequently the nose is lifted, *L* being forward of *W*. Pressure *S* on the tail is zero or slightly negative at the start so the airplane rises into position shown in Fig. 5 with the longitudinal axis inclined upward. In this position component *L* is greater than at the start, and forward component *P* is less. Consequently with increased lift and less propulsive force the nose of the airplane will rise sharply and horizontal speed will drop. Also, the slipstream of the propeller together with the travel of the airplane along the thrust line will cause an extreme down pressure on the stabilizer. The result will be a sharply nosing up tendency due to the couple of lifting forces *L* and down pressure *S* acting about the c.g. as a pivot. This will cause the machine to rise more rapidly and more vertically.

In the next position, Fig. 5, component *L* is still greater and *P* is even less. So we see that as flight progresses and *L* becomes greater the plane will nose up sharply into a vertical position, and if it is still moving approximately along the thrust line instead of merely hanging in flight it will loop due to the down pressure *S* on the tail. Even though it was stationary with the thrust line vertical it would turn over sharply on its back because of the negative tail pressure *S* generated by the slipstream.

In order to have this plane climb evenly and at a steady rate some means must be found to control the value of the lifting force *L* as angle of climb increases. This is only possible by operating the guide lines so that the tail lifts and force *S* acts upward instead of downward, at the desired climbing angle. Unless there is a lift on the tail at the desired angle of climb to balance the upward force L of the propeller, there can be no longitudinal stability because the c.g. is to the rear of upward force *L*. In other words, forces

(*Turn to page* 52)

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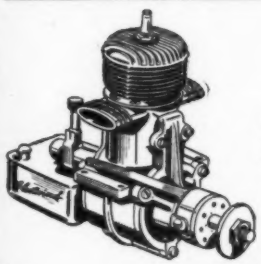

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Merlin .24	21.50
Ohlsson .23	16.50
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OK Super .60	21.00
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L and *S* must support the weight at c.g.

According to the design shown, it is doubtful if a positive lift force can be created on the V tail by pulling down the elevators with the guide lines, and if so, it must change constantly to equalize the unstable constantly changing lift force *L*. Therefore it becomes obvious that downward forces *S* and c.g. acting to the rear of upward force *L* will create a continuous stalling couple resulting in one loop after the other unless terra firma intervenes.

We suggest that Mr. Clough create a design in which the propeller or propellers are located at c.g. or on a line laterally with c.g., inclining these propellers slightly upward. In this way he will generate a lift force coincident with c.g. that will not disturb the balance of the airplane. In fact, he will be following orthodox helicopter practice. The airplane he shows here is nothing more than a helicopter. It may prove interesting as an experiment but its performance is doubtful.

Propeller Design

(*Continued from page* 25)

tips to decrease *induced* drag, the model prop must have wide spade-line tips to reduce *profile* drag. True, induced drag is increased thereby, but the reduction in profile drag far offsets it and the net gain in efficiency is considerable.

Refer to Fig. 2 again and note how the curve for this hypothetical prop continues to rise right to the tips until it reaches those higher values of *R* at which airfoils like the N.A.C.A. 6406 already have reached the super-critical state.

The increased blade area *may* make it advisable to cut down the diameter in order to allow the motor to reach most effective rpm, but it is *possible* that the overall decrease in drag will allow the motor to run at full speed anyway—and of course thrust will show a marked increase.

Unhappily there is very little that can be done to assure a turbulent boundary layer over the root, so admit defeat and fit the largest spinner possible. As for the remaining part of the blade radius which is still in the sub-critical range, or close to it, the easiest way to improve conditions is to roughen the leading edge for about 30% of the chord with any fairly coarse granular substance (sugar, ground cork, grit, etc.) stuck on with dope or shellac. Even a strip of 1/32" square balsa cemented along the leading edge at about 30% of the chord might do the trick easily, neatly and efficiently once its exact location has been established by experiment.

It has been proved that the thin airfoil with a definite concave undercamber has better characteristics in the lower region of the aerodynamic scale. This explains the popularity of such airfoils as the N.A.C.A. 6409 or the Eiffel 432 for high performance contest models. The mere fact that such profiles fall prey to acute gust sensitivity and need large horizontal tail surfaces to stabilize them becomes no problem at all when they are employed as prop sections.

For the reader who has succeeded in convincing himself that he just can't carve his own, an opportunity to experiment is still there if he buys an oversize prop, and adapts it accordingly by squaring up the tips, whittling down the roots and undercambering the section. But if the reader is skilled enough to build a

(*Turn to page* 54)

The Inside Story of ARDEN .099

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A steel piston that is centerless lapped to give perfect fit to the cylinder. Serves to reduce frictional loss of power while maintaining perfect compression. The ball and socket joint permits piston to rotate as it reciprocates . . . even distribution of wear.

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MODEL AIRFOILS

MANY readers have asked, after reading the article "Reynolds Number" in the April issue of MODEL AIRPLANE NEWS, how to use the data therein to select their own sections. In our August issue W. H. S. Bird and J. S. Luck will tell just how this may be done, and they will give sample airfoils.

whole ship he is adequately capable of making a propeller—it really is quite easy if it has been laid out properly and is worth the trouble when that little extra bit of performance is needed.

All the foregoing has been directed at gas model propellers—and rightly so, for the usual high-performance rubber job employs a prop far more in keeping with low speed aerodynamic knowledge. The thin blade section is concave undercambered and only the tips are eligible for contour improvement. Due to the comparatively low rotational velocity, the rubber driven prop is usually far down in the sub-critical range despite the rather wide blades. It is apparently unreasonable to lower the *R* still further by tapering off the tips. Here, even more than for the gas model propeller, any decrease in induced drag from beautifully rounded tips is completely overshadowed by the tremendous rise in profile drag. The creation of artificial boundary layer turbulence is simple. The leading edge of a "folder" is well protected in landings, so sharpen it and roughen the first 20% to 30% of the chord. And lastly, it would be better if the entire prop had a grainy surface as opposed to that brilliant glossy finish which has in the past been the result of prodigious energy, a delight to the eye and an object of pride to the meticulous craftsman.

NOTE: The authors regret that at the time of writing it was not possible to publish the results of tests at present being carried out. It was felt that the findings would have to be far more closely checked, and exhaustive experiments must continue for some time before any reliable data could be published or definite comparisons made.

Although this has not been written to promote argument and is given in good faith for what it is worth, we will be grateful to any reader who, finding cause for disagreement substantiated by his own experiments, will write to us c/o the Editor. Letters so received will be gratefully acknowledged and will receive most careful attention.

REFERENCES:

1. *AIRPLANE DESIGN (PERFORMANCE)—WARNER*
2. *AIRCRAFT PROPELLER DESIGN—WEICK*
3. *AIRFOIL SECTION CHARACTERISTICS AS AFFECTED BY VARIATIONS OF REYNOLDS NUMBER (N.A.C.A. REPORT No. 586)—JACOBS & SHERMAN*
4. *MECHANICAL ENGINEERS HANDBOOK (4th Edition)—MARKS*
5. *AERODYNAMIC DES FLUGMODELLS (TRAGFLUGELMESSUNGEN)—SCHMITZ*

Air Ways

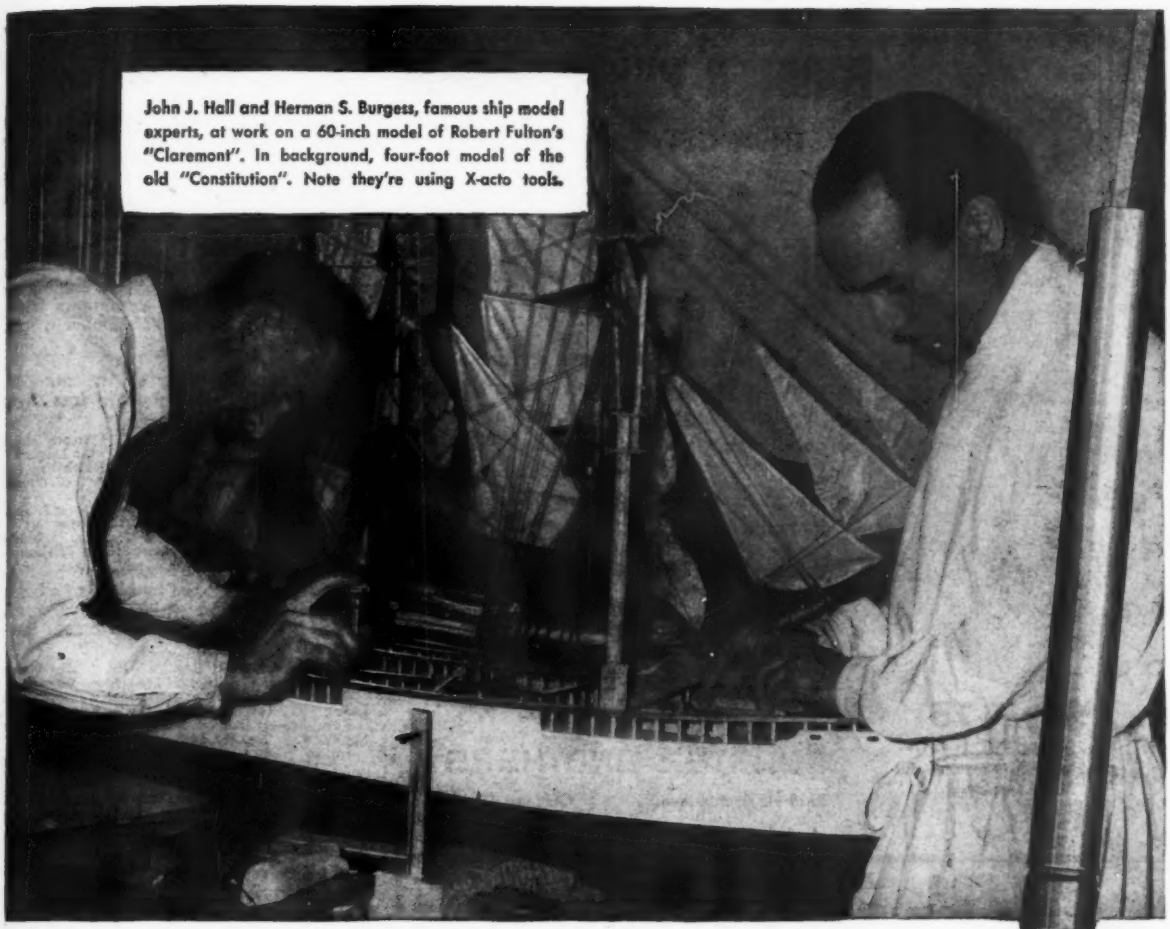
(*Continued from page 27*)

project since Mr. Johnson notes that it is only the second model he has built; however, he had considerable background for this work having been in the Air Corps for some time.

The glider in No. 11 was built by Elieser Benchimol, Libreria Americana, Obera, Mnes, Argentina, who says it is his own design although inspired by the *Thermic* series. Mr. Benchimol, who is 19 years old, wishes us to note that he is anxious to correspond with model builders in the United States and to exchange magazines or photographs.

A. H. Requarth, of 904 York St., Michigan City, Ind., designed and built the speedy looking U-control model in No. 12, which he says contains all the practical knowledge he has amassed in his ten years of gas model building. The ship has a 31" span with a front taper on the wing of approximately 40°. Overall weight is 2¾ lbs. and the power plant is an inverted Atwood *Champion*. Mr. Requarth feels this size model is neither too small nor too large and that it will be just about right as a medium size ship although it should

(*Turn to page 56*)



John J. Hall and Herman S. Burgess, famous ship model experts, at work on a 60-inch model of Robert Fulton's "Claremont". In background, four-foot model of the old "Constitution". Note they're using X-acto tools.

"You'll build better models with X-acto!"

"WE'VE used X-acto Knives and Tools for years . . . and we recommend them highly to all model builders," say President Burgess and Commodore Hall of New York's Model Schooner Club.

And that's advice worth heeding, for Hall and Burgess boats are consistent winners at the annual Model Yacht Regatta in Central Park.

Whether *you* are an amateur or a professional . . . a model builder, whittler, or the family Mr. Fix-it, you'll do a slicker job, and *quicker*, with these removable blade hobby knives. And now that the war is over, X-acto Knives are ***all-metal*** —no more substitute plastics!

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X-acto No. 2 solid duraluminum Knife . . . **50c**

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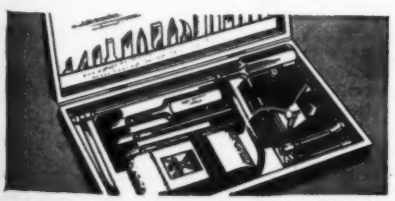

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have no more drag than one of 18" to 24" span.

CLUB NEWS

Alabama

A variety of events and $2000 in prizes were the features of the State Miniature Air Carnival held at Dothian on June 1. Open to modelers of both sexes, the meet program included these contests: free flight rubber, tow line and U-control, Jr. and Sr.; speed, stunt and precision flying.

ROBERT HAFFNER writes us that the *Birmingham Sky-Dusters* are really boosting their annual contest, coming up on June 16, by offering as winners' booty two or more trips to the Nationals in July.

California

THE *Fresno Gas Model Airplane Club* posts results of its monthly free flight contest for February:

Class A—1. Keith Etheridge 2. Clarence Mason 3. Fred Mosier 4. Ralph Mower 5. John Marshall
Class B—1. Dutch Van Tassell 2. Dutch Van Tassell 3. Martin Martin 4. Paul Rozell 5. Francis Stewart
Class C—1. Roland Harper 2. Bud Warner 3. Tommy Cochran 4. Francis Stewart 5. Bob Vogel
Juniors—1. Tommy Cochran 2. Keith Etheridge 3. Fred Mosier 4. Henry Vincent 5. Ray Balekian

The F.G.M.A.C. glider event held on March 10 was marked by some nice flying in spite of a wind which prevented any record breaking stints. The winners' line-up was as follows:

Hand Launched—1. Ray Balekian 2. Bud Warner 3. Bud Warner 4. Dick Lassig 5. Henry Vincent
Catapult—1. Ray Balekian 2. Bud Warner 3. Dick Lassig 4. L. Gustafson 5. R. Gates
Tow-Line—1. Dale Sherrill 2. Ray Balekian 3. Dale Sherrill 4. J. Krocker 5. R. James

THE *Bakersfield Gas Model Airplane Assn.'s* 6th Annual Contest drew a crowd of 7000 spectators to Minter Army Airfield on Sunday, April 14. 113 entrants flew their models in contests operated under modified AMA rules with a maximum flight time of 10 min. Jack Dyer of Brisbane won the Wickersham Trophy and $75 in cash for the best performance with two flights of 10 min. in a total of 31.5 sec. engine run; while Jack Byrd of Bakersfield placed in the best single flight with a 10 min. flight of only .09.5 sec. engine run, capturing for himself the Fresno Gas Model Airplane Assn. Trophy.

Winners in the various classes were:

Class A—Frank Cummings, John Stenderup, R. Randolph, Richard Beggs, Bill Creany Jr.
Class B—Jack Dyer, Martin A. Martin, Dutch Van Tassell, Carl Stokes, Jr., Bernie Simpson
Class C—Eugene Oldershaw, Paul Nieto Jr., Joe Menezes, Ray Acord, Vernon Oldershaw

THE *East Bay Aeroneers'* AMA-sanctioned ROW record trials, postponed from February because of bad weather conditions, were run off on March 17. Winners:

Class A—Dick Verba, Jack Dyer
Class B—Don Foote, Russ Watkins, Al Davis, Bill Steese
Class C—Charles Hubbard, Charles Doane, Milton Taylor

Junior and senior microfilm flyers held forth in an indoor contest on March 11. Jim Phelan and Walt Hubbard came through with first and second places in the junior event; Bob Mallory, Hank Cole and Jack Dyer captured first, second and third positions.

E.B.A.A. and N.B.A. members, together with several non-club members participated in an indoor hand launched glider contest on March 25. Judges handed in the following decisions:

Junior—1. Walt Hubbard 2. John Nelson
Senior—1. Stan Stufflebeam 2. Jack Dyer 3. Stan Stufflebeam 4. Les Hartmann

THE San Francisco Recreation Department's newsy little paper, *The Third Dimension*, keeps us up to date on the Department's model club activities. On March 9 a hand launched pusher contest was run off; on March 23 a towline glider

meet was staged. The annual spring contest on April 21 featured both hand launched and towline classes in junior and senior divisions.

Connecticut

On May 18 & 19 the Hartford *Courant* in association with the Conn. chapter of NAA sponsored a national regional meet, the Yankee Model Airplane Championships. Pennsylvania, New York and Maryland as well as the New England states were represented in this first sectional meet to be held under the 1946 AMA program. Settings for the two day round of flying events were the Hartford Armory and Bradley Field, an Army air base situated between Hartford and Springfield.

Illinois

The *Harvey Strato-cats,* in existence since February 1943, have written to *Club News* for the first time to inform us of a five-event meet they will stage on Aug. 11 at Dolton. Richard Knapp writes us that the *Strato-cats* are old hands at the meet game so spectators and contestants can expect a smooth runoff of events—these will include speed, stunt obstacle, combat and motor control contests.

Indiana

Members of Kokomo's recently formed high school *Aeronautics Club* held their first meet on May 19 in which gas model events were featured. We are awaiting results of the club's initial venture into the contest field.

Iowa

Sioux City's Junior Chamber of Commerce is sponsoring its sixth annual Midwest Model Airplane Contest on July 28. From 200 to 300 entries and a crowd turnout of 2000 to 4000 are expected.

Kansas

COMPOSED of U-control and free flight fans, the *Sky Hawks* of Kansas City, 32 strong, have planned an active flying season. The club, sponsored by the City Recreation Dept., admits boys and girls from age six up and meets and works in a fully equipped work room. The following officers have been elected: Harold Wickey, Pres.; Mike Yurkovich, Vice Pres.; Bill Henry, Secy.-Treas.; Jo Ann Vermillion, Editor; Don Griffin, Senior Advisor.

The *Hawks* plan to attend as many meets as possible this summer in the Missouri area and in Nebraska and Kansas. Anyone who wishes to join this organization or secure a copy of the official club paper, the *Hawks' Cry,* should contact Naomi Griffin, 1713 Minnesota Ave., Kansas City.

The Mid-States Model Aeronautical Assn. has announced the following schedule of meets. Modelers interested in entering these contests should write to the individuals named:

June 16—Missouri State Meet, Kansas City, Mo. "Pop" Schreiber, 3507 Prospect, K. C., Mo.
June 23—St. Joseph, Mo. A. F. Pierce, 3012 Penn., St. Joseph
July 13 & 14—Tulsa, Okla. Terry Monteith, 725 N. Wheeling, Tulsa
July 20 & 21—Webster Groves, St. Louis, Mo. O. L. Elbring, 475 E. Lockwood, St. Louis
July 27 & 28—Sedalia, Mo. Elmer Sterling, 115 W. 5th St., Sedalia
Aug. 3 & 4—Oklahoma City, Okla., Model Avia. Club. Paul J. Lower, 115 W. Main St., O. C.
Aug. 10 & 11—Alma, Kansas. Don Holcomb
Sept. 1 & 2—Wichita, Kansas—Kiwanis Y.M.C.A. Contest. Al Hummel, 4007 E. Kellogg, Wichita

New York

THE *Westchester Aeronuts* are presently engaged in organizing lower Westchester County's most active and capable model-

(*Turn to page* 59)

ers for an extensive program of model competition. Both indoor and outdoor flying facilities have been secured for meets and a trip to the Nationals for a share in the winnings is in the offing. A. A. Tiso urges model enthusiasts interested in joining the *Aeronuts* to get in touch with him c/o Zephyr Modelcraft, 123 Fourth Ave., Mount Vernon.

THE Staten Island *Snafu Aeronuts* boast a membership of 20 and hold regular competitive programs at the Tysen Golf Course, New Dorp. Richard Geidel sent in photographic news of a recent contest run off by the fellows with fine flying results.

A NORTHERN N.Y. invitational outdoor meet was the high spot for modelers on Sunday June 9 at the Watertown Airport. The meet, AMA-sanctioned and sponsored by the Watertown *Lions Club* and Watertown *Aeroneers*, gave contestants a chance to aim for $125 in cash and merchandise and to compete in the following events: HL gliders, HL stick, towline gliders, cabin ROG, Classes A, B and C gas.

North Carolina

S. R. Walton writes us about the organization of a club in High Point, the *Model Masters*. Membership is small but an active flying program has always been promoted by the fellows.

Ohio

The *Columbus Model Airplane Club's* paper, the *Gas Tank*, reports an increase in membership and keeps us up to date on the Ohio Assn. contest schedule. Three meets are now in the offing: on July 28 at Dayton; Aug. 11 at Columbus; Aug. 18 at Cincinnati. The club's recently held motor starting contest provided some excitement and a lot of fun for members. Placing in first four positions were Zelinski, Blount, Oberly and Sierer.

Oklahoma

Last month's *Club News* reported formation of a hobby club in Enid and now, taking our cue from Frank Simard, we find that *three* have been established with another under way. A junior club is being sponsored by the local V.F.W. branch; the *Enid Thunderbirds* have organized under the watchful eye of the *Joycees*, of which Mr. Simard is a member. The third club has been formed by servicemen at the Enid Army Air Base.

Oregon

The *Portland Gashoppers* held their annual election of officers with these results: Charles Cleaver, Pres.; Richard Nichol, Vice Pres.; Barr Fletcher, Secy.; Vic Stuhr, Treas.; Douglas Mac Coach, Corr. Secy.; Rex Baumgardner, Contest Dir.; Frank Swoboda, Sgt. at Arms; Glen Propst, Club Historian.

Pennsylvania

Pittsburgh's *International Gas Model Airplane Association*, Unit No. 1, has published its 1946 calendar of events, scheduling a full season of weekly gas model meets governed by AMA rulings. For details contact Bob Flinn, tri-state coordinator, 4412 Butler St., Pittsburgh.

Tennessee

The *Crossville Model Airplane Club*, with the Chronicle Publishing Co. and the Trade-A-Plane Service holding sponsorship reins, held a large meet on June 9. Eight events with two age divisions in each contest were run off and prize awards included gas model engines, kits, model supplies and merchandise.

Washington, D.C.

Nearby Bailey's Crossroads afforded Washingtonians the opportunity of witnessing and participating in a two-event contest sponsored by the National Airport of Washington and the Washington *Evening Star* on June 9. AMA sanctioned, the events run off and judged were: free flight gas models (Classes A, B and C combined), control line speed models (Classes B and C). Winners received trophies, model motors, model merchandise, flight instruction and airplane trips. Contestants were treated to the innovation of a light airplane equipped with a two-way radio to aid them in retrieving their models; and spectators saw a radio controlled model demonstration.

Wisconsin

Milwaukee modelers have the opportunity to join a new club, the *Milwaukee U-Control*. Members now number 27; any model builder interested in becoming a member of the group may write to Frank Zielke, 3321 N. Palmer St., Milwaukee.

Canada

Joseph Stefani, Pres., and James Graves, Secy., of the *Windsor Model Aircraft Club* have notified us of their 8th Annual International Model Aircraft Contest: date—July 28; events—Classes A, B and C gas free flight, and combined class towline glider. James Graves, 1555 Church St., Windsor, Ont. can supply you with further information.

Members may well be proud of their club's record. Founded in 1927, its interest in model flying, both outdoor and indoor, has never flagged. Meetings are held weekly at the Y.M.C.A. and right now returning vets are strengthening the ranks which include a membership of 35.

Puerto Rico

April 16, De Diego Day, a Puerto Rican holiday, saw the first model plane exhibition in the history of the island. Model builders, given the opportunity to exchange ideas and learn new techniques, gathered in a San Juan baseball park and witnessed guest performances by P.A.A. personnel of North American technical model plane tactics. The show was promoted by the Miami Junior Chamber of Commerce in accordance with their long range program to increase interest in aviation through model plane meets.

Turkey

A report on model club doings in Turkey is indeed an unusual addition to *Club News*. Mr. Paul Nilson tells us that with the end of the war an active interest in the organization of clubs is once again being fostered by educators throughout the country. Development of school groups is sponsored chiefly by the National Airplanes Assn. and the Ministry of Education in Ankara. Students of the American School for Boys, Talas, Kayseri founded their Airplane Club ten years ago and until now have been using only rubber powered models because small gas motors are virtually non-existent in Turkey.

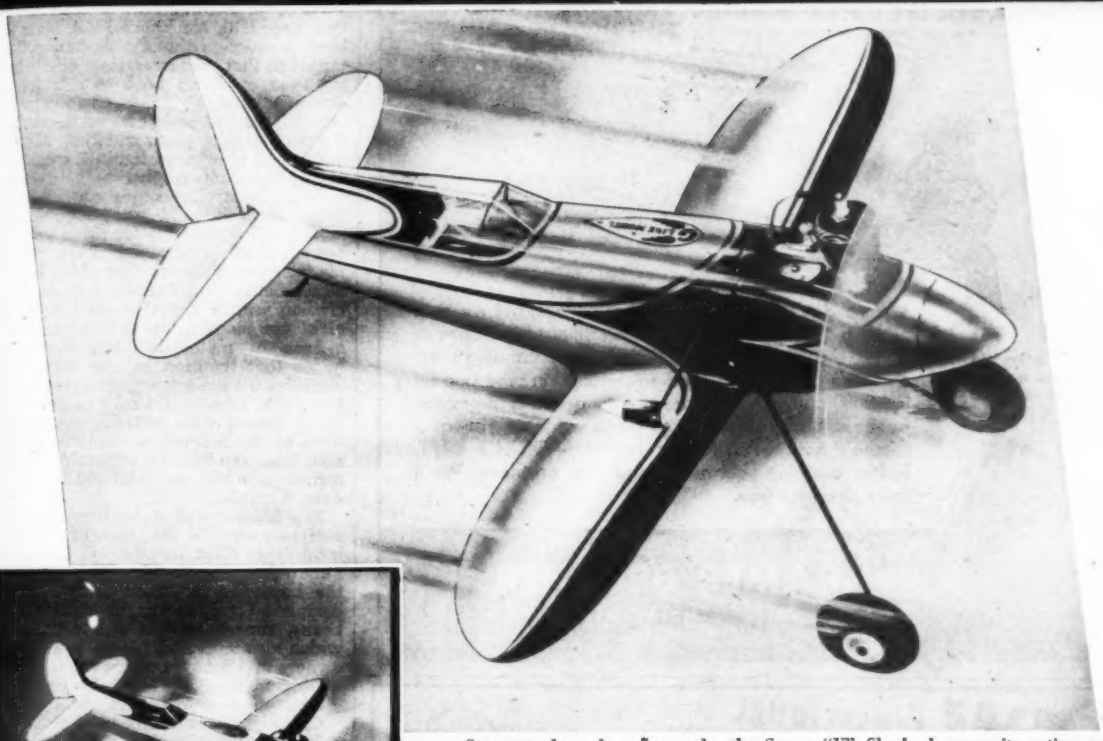
NEWS OF MODELERS

A. H. Vetter Jr., 358 E. St., Chula Vista, Calif., a recent Navy dischargee, is a U-control model builder who is anxious to exchange ideas and plans with East Coast modelers.

A 1914-1918 aircraft fan, D. S. Larner, 184 Hampton Rd., Twickenham, Middlesex, England is desirous of exchanging magazines, books and plans with Amer-

(*Turn to page* 62)

RACY · RUGGED · and FULL of FLIGHT...
STANZEL *Super* "V" SHARK



Super-sturdy and super-speedy, the Super "V" Shark deserves its rating as the best speed-and-stunt model for Class "B" and "C" motors. The streamlined, G-line Super Shark hits a phenomenal 120 m.p.h. and features the new, improved Roller Control. Built of balsa, with hardwood and plywood reinforcing stress points, the model's durability is increased by an all-steel landing gear.

$4.95 PLUS 30c POSTAGE

THE BABY "V" SHARK

This remarkably perfect model is designed for Class "A" and "B" motors and is sturdily constructed of balsa, hardwood and plywood, with an all-steel landing gear. Boasting a 20-inch wingspread, speed in excess of 100 m.p.h. and championship performance, the Baby "V" Shark is an ideal G-line model for a beginner. **$2.95**

PLUS 25c POSTAGE

THE INTERCEPTOR

A gracefully streamlined Class "B" Free Flight Model of strong climbing qualities, the Interceptor has an unusually flat, lingering glide. Wing span — 52 inches . . . simple to construct . . . easy to fly.

$2.98

PLUS 30c POSTAGE

THE TIGER SHARK

Especially designed for Class "C" motors, this single line model is recommended to those not interested in elevator control. Unusually stable, with large wing area, the Tiger Shark performs perfectly in flight. Simple to construct . . . easy to fly.

$4.95

PLUS 30c POSTAGE

STANZEL MODEL CONSTRUCTION KITS

include everything needed . . . ample supplies of carefully selected balsa, plywood, hardwood, cement, dope, music wire, screws, etc. Also complete plans and instructions for building and flying. Your favorite model dealer features these kits.

100 FEET STEEL G-LINE 50c

VICTOR STANZEL and CO.

First in Control Line Flying

SCHULENBURG, TEXAS

ican modelers. Four more of our English friends have sent in similar requests: Ron H. Greaves, 47 Moorpark Rd., Turves Green, Northfield, Birmingham 31; Raymond Jackson, Higher Ridge Cottage, Brunshaw, Burnley Lanes; Ronald J. Pearson Thomas, 18 Abbeyhills Rd., Oldham, Lancs.; S. W. Trimmer, 21 Grosevenor Crescent, Hillingdon, Middlesex.

W. J. C. Pennalligen, 10 Irirangi Rd., One Tree Hill, Auckland S.E.4, New Zealand, a cadet in the Air Training Corps, writes us that he'd appreciate our informing readers of his wish to contact correspondents in the U.S.A., Canada or England who would be interested in exchanging photographs, plans and kits. Mr. Pennalligen is also interested in the collection of airplane photographs.

From Australia comes an interesting letter from a solid and detailed scale model enthusiast who for some years has been "forcibly restrained" from pursuing his favorite hobby because of his R.A.A.F. attachment. Jim Prendergast is now a civilian with a yen towards construction of bigger models, but is handicapped by a lack of materials. Mr. Prendergast hopes that mention in this column will "procure for me a few guys in any part of the world who would care to drop a line to an Aussie who certainly needs a few hints on the subject of airplane modeling and also aviation in general." Readers can write to him at: McLeod St., Bairnsdale, Victoria.

The *Binghamton Balsa Bugs* report the disappearance of five motors from their local Boys' Club on Sunday, January 13. Fellow modellers are requested to help the boys recover these motors and the complete ignition units—coils, battery boxes, timers, wheels and condensers—which also vanished. Here is a listing of owners and motor numbers:

Ohlsson 23—35698—Bob Freer
Ohlsson 23—36724—Don Robb
Ohlsson 23—no number—John Kavulich
Forster 29—1502—Bob Freer
Vivell 35—no number—Donnell Brown

Direct any information to Crosby Wakeman, Secy., Binghamton Balsa Bugs, 257 Washington St., Binghamton, N.Y.

Harry York, a Wakefield Cup Team member in 1936 and 1939, and now honorary secretary of the Assn. of the Fellows, Society of Model Aeronautical Engineers, would like to contact again fellow contestants whose acquaintance he made during the Wakefield competitions. Mr. York's address is 23 Tyson Rd., Forest Hill, London S.E.22.

Edward Smith, Box 202, Tuskegee, Ala. is a model builder of 12 years standing, an ex-AAF pilot who believes in the theory of modeling as an unequalled method for teaching the fundamentals of flying. He'd like to hear from other modelers in the United States.

John Tyler, 434 W. 120 St., New York City is a newcomer in the model field and is chiefly interested in free flight gas and control line flying. John is anxious to correspond with other fledgling model builders.

Ex-Sgt. Archie T. Chapel of 710 Bell Ave., Lawton, Okla. is interested in re-establishing contact with fellow modelers he met while in service.

A photograph published in *Air Ways*, Feb. 1944, of a scale model 1909 Glenn Martin ship has prompted Edwin S. Hunt, 3302 So. Quincy Ave., Milwaukee, Wis. to write us requesting the address of its builder, R. S. Nevin. Mr. Hunt is very much interested in building a similar model and hopes that this notice in *News of Modelers* will enable Mr. Nevin to contact him.

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We Have What You Want in Stock, Now! No Delay!

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The New ARDEN Class "A" MOTOR

$19.50

Incl. Coil & Condenser
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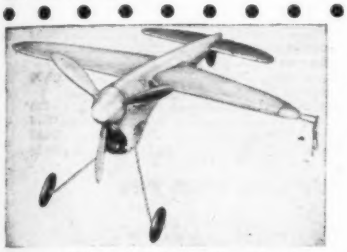
It weighs only 2¼ ounces, but it's packed with power that will thrill you, and make your favorite model a "best" performer. .099 cubic inch displacement. Dependable and easy starting.



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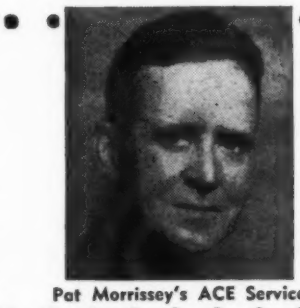

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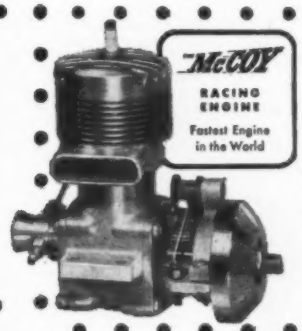

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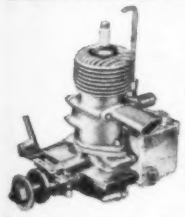

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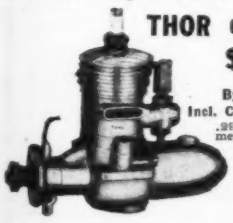

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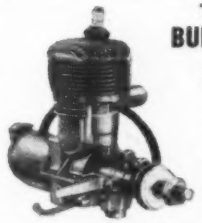

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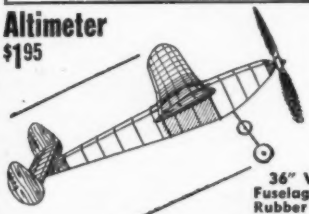

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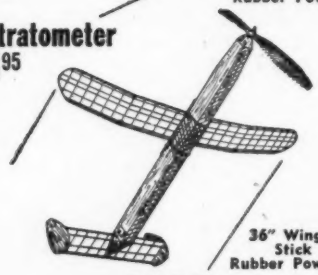

36" Wingspan
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LET'S LOOK AT THE RULES!

by BILL EFFINGER

EVERY year it is the same old cry of: "Change the contest rules!" Model leaders from all over the country get together twice each year and argue about the rules. Everyone wants to give the contestant the best possible break yet no one agrees on the best way of doing it. It appears as though nobody takes time out to calculate what is best but everyone has "opinions."

The rules which have always caused the most controversy were those for gasoline powered models. Long strides in developing fair rules have been made since the 1934 Nationals when gas models won every event competing against rubber powered models and using all the fuel the plane could carry. The first gas model contest limited fuel to 1/4 ounce for each pound of weight. If you could keep your engine running steadily the power flight took about 12 min., and length of the flight depended entirely on the timer's eyesight. Quite often the precise moment that the plane disappeared from sight was a speculation. It wasn't unusual to see a contestant arguing with a contest director and timer that his plane was "right over there," although no one else could see it. Nor was it unusual to see a group of contestants racing along in a car with a timer in the back seat while they stood on the running board shouting "There it is!" as they pointed to what were actually spots in front of their eyes.

The gas allowance was cut to 1/8 oz., then to 1/16 oz. per pound. The more the gas allowance was cut, the longer the unscrupulous model builder worked into the night designing "special" gas tanks. And the more the indignation of the contestant who wanted to play the game squarely. Finally the idea of using flight timers and limiting the engine run began to take hold in various parts of the country and was later adopted as the national rule.

But, with gas allowance faults eliminated, new problems arose with the limited engine run. No limitations on size and power resulted in a freak class of "skyrockets" that used as much power as they could hold and with any resemblance to a real airplane purely coincidental. Each year a few new restrictions were added. Engine displacement classifications were made, power loading rulings were added, and in general contestants were more satisfied although too many models were still flying out of sight.

It would be most unusual to see every contestant and every member of the A.M.A. satisfied with the rules, no matter how fair they were. Model builders are of the type of men who are always looking for improvement and striving for perfection. But all members would like to see rules in which the best man wins and in which no one has to lose his plane and engine in order to earn a trophy or medal. The only solution to preventing lost models is to make rules that reduce the possibility of models soaring out of sight. The only way that the factors which make models fly out of sight can be determined is to analyze the flight performance of a model.

Power Flight Performance: The power of a model is the thrust horsepower of the propeller. This depends on the propeller efficiency and the power of the motor. In normal steady level flight a certain amount of power is required. Any power in addition to the power required for level flight is used for climb. Preliminary investigation of the performance of gas models today indicates that the power used is actually *twenty times* that required for level flight. Flight conditions of such a model is practically vertical with the wings contributing no lift. The power of the engine is absorbed by the weight and drag of the model when it is in this attitude.

Gliding Flight Performance: The best glide of a model for maximum endurance is that giving minimum sinking speed. The sinking speed will be equal to the model's forward speed divided by its lift-drag ratio. The best forward speed to give the lowest sinking can be ascertained mathematically or experimentally for any model.

Gliding flight performance is also affected by thermal conditions of the air at time of flight. The thermal currents and their effect on the model's performance cannot be predicted in advance. However, experience indicates that a good thermal over a considerable area averages about 2 ft. per second upward. Local risers have been measured at 10 ft. per sec. But for every up-current there must be a down-current; therefore we can consider 2 ft. per sec. as the most effective thermal for gliding flight performance.

Flight Duration: The total time a model will stay in the air is equal to length of motor run plus the altitude attained divided by the sinking speed. From this it can be seen that in limiting the duration we limit the altitude attained or increase the sinking speed. Present rules calling for a minimum weight of 80 oz. per cu. in. engine displacement, and a 20 sec. engine run adequately limit the duration. Also, a model must weigh not less than 7 oz. per 100 sq. in. of wing area.

With present engines the maximum altitude gained in 20 sec. is about 700 ft. This rule is flexible enough to give the builder an opportunity to design a model to fully utilize the power at his disposal and still have a rugged, durable ship. Any further d-

(*Turn to page 68*)

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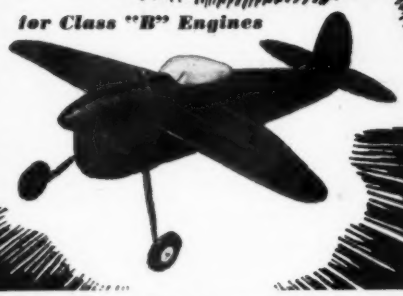

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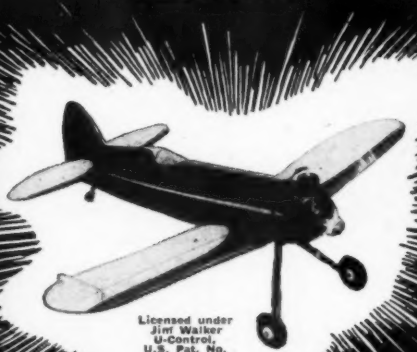

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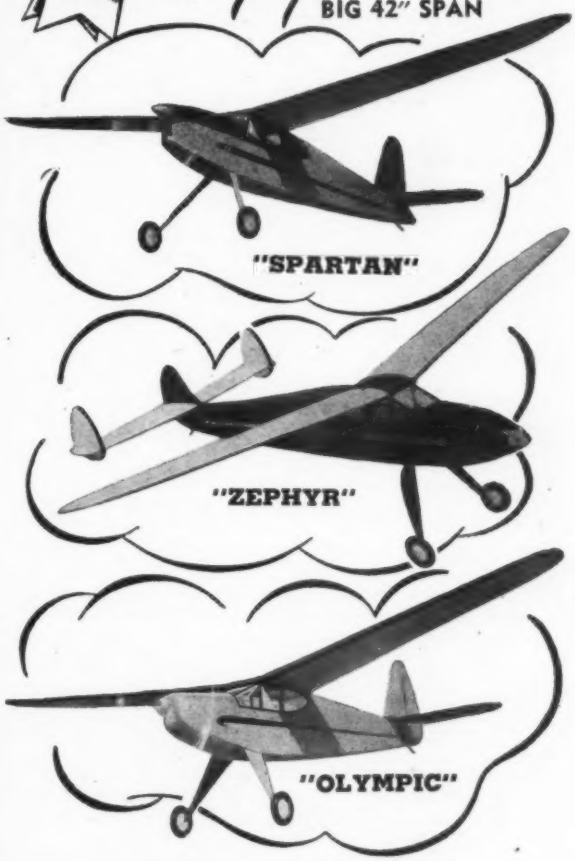

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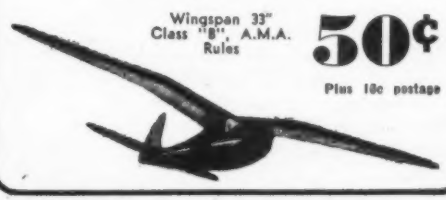

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crease in the flight time would reduce the percentage of accuracy of the timing.

From this it can be seen that the only alternative is to increase the sinking speed. This can be accomplished by increasing the drag of the model. The most effective way of increasing the drag is by increasing the crossection of the fuselage.

To better understand what happens with varying fuselage crossections and flying the model in various thermal conditions, consider the performance of a typical Class B gas model.

Typical Example: A model is powered with an engine of .29 cu. in. displacement developing 1/6 hp at 6500 rpm and having a propeller efficiency of 55%. The model weighs 30 oz. and wing area is 432 sq. in. with an aspect ratio of 8. The airfoil section of the wing is the N.A.C.A. 6412 on which test data is supplied from N.A.C.A. Technical Reports. Air density will be assumed to be the standard density at 2000 ft. This assumption is better than sea level standard density since models are usually flown on warm days and often from fields 400 to 1000 ft. above sea level.

The engine will be fully cowled and the fuselage rectangular with rounded corners. The prop will fold in the glide and the landing gear is retractable. Fuselage drag on a similar model with 6.65 sq. in. crossection at 40 mph is .35 oz. Therefore the drag in ounces for any similar fuselage will be:

$$\text{DRAG} = \frac{[\text{Speed (mph)}]^2 \times \text{Crossection Area}}{30{,}400}$$

We will test the model with crossection areas of 10, 30, 60 and 90 sq. in.

Power Flight: Preliminary estimates show that the excess power is from 15 to 20 times the power required for level flight and therefore the best climb will be nearly vertical. When this condition exists,

$$\text{Thrust} = \text{Weight} + \text{Drag}$$

The thrust horsepower (THP) equals the prop efficiency multiplied by the engine brake horsepower, or 0.0917 hp.

The lift can be considered zero in vertical flight and therefore the lift coefficient is zero. The drag coefficient of the wing is .053 for this condition. Since

$$\text{THP} = \frac{\text{Thrust (ounces)} \times \text{Speed (mph)}}{6000} = .0917$$

then,

$$V = \frac{550}{T} = \frac{550}{W+D} \text{ where } W = 30 \text{ oz., } D = \frac{C_D \times \text{Speed}^2 \times \text{Wing Area} \times 2.75}{10{,}000}$$

$$V = \frac{550}{30 + (.119\, C_D \times V^2)} \text{ and } V^3 + \frac{202V}{C_D} - \frac{4630}{C_D} = 0$$

where V is in miles per hour and must be converted to feet for a 20 sec. engine run. The results are shown in the "Table of Results."

Gliding Flight: The best duration will be obtained at minimum sinking speed which will be close to the value at which the profile drag of the wing is a minimum. At this value the lift coefficient is .70, and since the sinking speed is,

$$V \times \frac{C_D}{C_L} \text{ where } V = 60.3 \sqrt{\frac{\text{W (oz.)}}{C_L \times \text{Area (sq. in.)}}} = 19 \text{ mph}$$

$$\text{Sinking Speed in ft./sec.} = 4D \times C_D$$

Values of the drag coefficient (C_D) are the total drag of the airplane, consisting of: profile drag of the wing; induced drag of the wing caused by lift of the wing and its tip disturbance; drag of the fuselage; and drags of the tail, prop hub, etc. (assumed at .1 oz.).

Flight Duration: The endurance of the model is now calculated for calm air and for upward thermals averaging 1 ft. per sec. and 2 ft. per sec. These results are also tabulated.

Conclusion from "Table of Results": We can see from the results that the drag has little effect on climb but increases sinking speed considerably. Models with small crossection are "lost" in thermals while models with larger crossection will descend in them. Therefore a rule making the fuselage crossection a function of the wing area would help prevent lost models more than any other ruling.

The following crossection ruling for gas models is proposed:

$$\text{Minimum Fuselage Crossection} = \frac{\text{Wing Area}}{\text{Five}}$$

(Measured at the section of Maximum Crossection.)

At first it may appear that this ruling will result in fuselages that look like milk bottles. Actually model builders could still fly their present ships but use less wing area. As model design develops under this rule, the result would be high aspect ratio wings with long fuselages, giving graceful lines and stability that is inherent. Design under this ruling would result in more attention to streamlining and there would be a better possibility of the best ship winning —which is what all real sportsmen want.

(*Turn to page* 70)

Table of Results

Fuselage Crossection Area	Climb Feet Per Minute	Cd Drag Coefficient in Climb	Altitude in 20 Seconds	Cd Drag Coefficient in Glide	Glide Sink Speed Ft. Per Min.	DURATION		
						Still Air	6 ft. per sec. Thermal	2 ft. per sec. Thermal
10 sq. in.	1450	.0588	483 ft.	.0493	1.97	4 min. 5 sec.	8 min. 17 sec.	"Lost"
30 sq. in.	1430	.0646	477 ft.	.0551	2.20	3 min. 37 sec.	6 min. 37 sec.	39 min. 40 sec.
60 sq. in.	1400	.0733	467 ft.	.0638	2.56	3 min. 4 sec.	4 min. 59 sec.	13 min. 54 sec.
90 sq. in.	1375	.0820	458 ft.	.0725	2.92	2 min. 37 sec.	3 min. 59 sec.	8 min. 18 sec.

West Coast Tips

(*Continued from page 10*)

used as a beautiful Class A, B or C free flight contest model.

While we are on the subject of new articles, a California firm is bringing out a new kit soon on the old Curtis Hawk P-6-E, one of our favorites and also a favorite with most of the old-timers who remember back when this one-time Army top pursuit plane used to rate headlines. The model, designed by Frank Greene, one of the real old-timers himself, is a beautiful flyer and close to scale. It appeared in the Lockheed contest with Grandpappy Greene at the controls and performed just like the real ship.

Incidentally, complete results of the Lockheed meet as well as the Santa Monica meet will appear in next month's column.

Also on the contest agenda is the big show scheduled the first week in June by the Ontario Skyhawks in connection with the Valley Race Car Assoc. They will have a big three-day combination model airplane and miniature race car meet at the Ontario, Calif. race track and ball park which are located adjacent to each other.

Wilmer White, Pres. of International Miniature Race Car Assoc., is handling the affair in conjunction with the Ontario Chamber of Commerce and the local Ontario paper. Entries are expected from the Canal Zone and Hawaii as well as from all over the U.S. Quite a big affair. Guess we had better make it.

We understand that engine rules are being changed with regard to control line speed flying. It seems to us that somebody is always trying to grind some axe at the same time they are trying to appear self-righteous. On the coast, U-Control speed flying is the fastest as well as the best of any place in the world at this time. Why not take a tip from the fellows and leave things as they are? The rules as they now read for engine disp. are as follows: Class A, 0-.25, Class B, .251-.50, Class C, .501-.65. None of the competitors at any contest kick about these rules so why change them. Next month we will tell you why some people want them changed.

Newsletter

(*Continued from page 6*)

become interested in modelplane activity and is arranging to sponsor meets.

3. Other newspapers throughout the country are evincing interest in clubs and contests. The success of the *Record*-sponsored meet in Philadelphia has done much to arouse their interest. Some newspapers like the Boston *Traveler*, Pittsburgh *Press*, Akron *Beacon-Journal*, Chicago *Times*, and Omaha *World-Herald* have long been behind aeromodeling. New ones include the Hartford, Conn. *Times* and *Courant*, Nashville *Banner*, Louisville *Courier-Journal*, Denver *Rocky Mountain News* and dozens of others. In the nation's capitol, the *Evening Star* is backing the first meet held in five years. Smaller papers also are becoming active. An example is the Quincy, Mass. *Patriot-Ledger* putting on a meet this summer.

4. One of the country's largest oil companies (gasoline and lubrications) is planning to put on a contest in every county east of the Mississippi.

5. The Institute of Air Age Activities, which is being set up with the initial backing of the Model Industry Association, is expected to focus much attention on modeling and to dig up a lot of new sponsors through publicity and personal contact.

So it's full steam ahead, mates. At last somebody is beginning to appreciate what model aviation is and what a constructive activity it can become.

* * *

BY THE WAY, back there a bit we were speaking of record trials. We forgot to mention that the indoor boys were frothing at the mouth over the chance to fly in the Lakehurst, N.J. naval airdock. They're out to try for that 30 minute record again. Stan Stanwick is stationed at Lakehurst and has obtained permission to run an indoor meet there. Merrick (Pete) Andrews, chairman of the A.M.A.

(*Turn to page 72*)

FLY • CONTROL • WIND-UP *with the* NEW "DTD" "ONE UNIT" CONTROLLER

Perfect POSITIVE flight control reel and handle—now combined in one, all-metal, 4 oz. unit! If you've ever built your own reel you'll appreciate the new "DTD" featherweight unit . . . sturdily designed with one continuous control cable, locked in, yet free to swivel for immediate wind-up. THAT'S RIGHT! Just wind the cable right onto the reel, snap the retainer in place, and stow it in a small part of your tool box. No. 9007, complete unit (140 ft. .012 wire and retainer).

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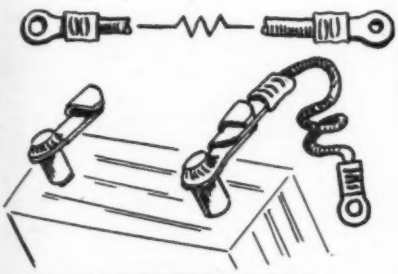

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WET CELL KIT NO. 8015—65c
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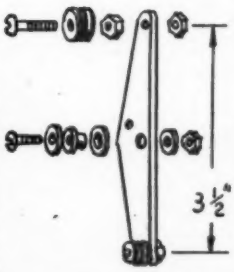

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- Design arrangement of 8 attaching holes allows adjustment for either speed or stunt flying.

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"DTD" METAL REEL

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- Special knurled knobs to give fast wind-out and wind-up.

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- Made of polished .040 Duralium.
- Design of hole pattern gives differential control. (Approx. ⅓ down, ⅔ up.)
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indoor committee and holder of the present high time of 26 minutes plus, will be johnny-on-the-spot when the affair is run off. Other experts from the Philadelphia-New York area have indicated they'll be on hand with their microfilm crates.

Speaking of microfilm models brings to mind the old saying:

"Of all the sad cases
Nothing can compare
With finding that the microfilm
On your wingframe isn't there!"

Okay, okay, we'll quit. . . .

* * *

HAROLD L. ROBINSON of Shelby, Ohio is in agreement with our proposal for an honorary Early Birds Gas Model club as first mentioned here. Howard reports: "I attended the Nationals back in '32 at Akron and saw Bassett and Kovel fly gas jobs for the first time. Soon afterward I had my own engine, a Gwinn Aero. I also held a membership in the old I.G.M.A.A. (M.A.N. sponsored) in '36 and '37. Your idea to form an Early Bird Gas Model Club meets with my approval; let's get after it. I am still active as a gas flyer and last summer won better than $50 in prizes."

* * *

ADD TO your lists of interesting modelers the name of Paul Shure who plays violin with the Philadelphia Orchestra. Paul is an ardent control line fan and when we last saw him he was hot on the trail of a jet motor.

* * *

ARE YOU a member of an active model aero club? Has your club been listed in the national roster of such organizations being compiled by the Academy of Model Aeronautics? If not, you should insist that the club secretary file application immediately. No charge. Doesn't matter whether your group is an Academy chapter or not. Reason for the listing is that modelers are always contacting A.M.A. headquarters asking for the names of clubs nearest their homes. If the Academy doesn't have your club listed it cannot help you line up these prospective members. Here is the official form. If you don't want to cut your copy of the magazine just copy this on a card 3" x 5"—*or smaller!* Must not be any larger than 3" x 5".

Send it to A.M.A. today. Don't delay! The plan is designed to benefit your organization—no one else.

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Please type or print and send to:
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Please include our club in the Roster of model societies on permanent file at A.M.A. headquarters and in your annual Directory.

☐ **We would appreciate your referring local inquiries to us.**

☐ **We are not seeking additional members.**

Name of club .....

Address ..... (Street) (City) (Zone) (State)

Date established .....

No. of members .....

Contact man .....
☐ President ☐ Director ☐ Advisor ☐ Secretary

Address ..... (Street) (City) (Zone) (State)

Date .....

A.M.A. Chapter, yes or no? .....

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Without Condenser or Coil

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SPECIFICATIONS

- .275 cubic inch displacement.
- ¾" bore—⅝" stroke.
- Weight—4¾ ounces.
- All major external parts are die cast.
- Shaft rotary valve.
- Heat treated precision ground crankshaft.
- Super-honed steel cylinder.
- Centerless ground Meehanite piston.
- Hardened steel timing cam.
- Attached fuel tank permits motor mounting upright or inverted.
- Die cast parts highly polished—all other parts have high lustre finish.
- Every motor fully guaranteed.

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Manufactured by **MINIATURE MOTORS, INC.**

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Plane on the Cover

(*Continued from page 23*)

fin extending forward of the vertical stabilizer.

While the *Navion* is a straightforward approach to the design of a personal airplane, with none of the tricky frills of the "spinproof" variety, its wing design does incorporate exceptionally good stall characteristics. While the stall is a dangerous lift-loosing maneuver, its greatest danger is in loss of aileron control which results in an inability on the part of the pilot to pick up a dropping wing. The *Navion's* wing is twisted, root to tip, in such a manner that the root section stalls first, the aileron regions last. Thus, when the plane begins to stall, loss of lift in the root area gently lowers the nose while the ailerons are still operating in an adequate airflow for lateral control. The twist is 3°, resulting in the root flying at an angle of attack much higher than the tips at all times.

Additionally, the tip makes use of a high lift section (large camber) which multiplies this difference to a degree making tip stall impossible without more than adequate warning. NAA engineers point out that this tip section produces the benefits of slots without their complexity, drag and sudden loss of lift. The flaps are of hinged trailing edge type and are a special slotted type operating from link posts extending below the wing. They are hydraulically operated and may be locked in several positions. The flaps and ailerons are metal covered with corrugated aluminum alloy, although the "corrugations" are created by stiffener beads in the formed skin panels.

The tail surfaces are full cantilever design with squared tips. Elevator and rudder are of beaded skin. The elevator has a controllable trim tab in the trailing edge of each half. The rudder trim tab extends the entire length of the trailing edge.

The landing gear is a tricycle type. The main wheels are supported on full cantilever struts which are connected to the spar by a heavy forged hinge fitting. The main gear retracts inward and lies flush with the wing lower surface. The nose wheel is supported by a yoke bolted to the strut; it retracts rearward into the nose. The landing gear is hydraulically operated. The main gear is fitted with hydraulic brakes. The nosewheel, which extends slightly from the fuselage in the retracted position, is steerable 20° and is of large diameter to simplify *Navion* operation from rough, weed grown fields when required.

The cabin is 43 in. wide and seats are arranged side by side. Dual controls are provided for the front two seats. The interior is sumptuously arranged and compares more favorably with a medium-priced automobile interior than any other lightplane. The perplexing problem of entrance and exit, which in the past has required tricky doors, folding or sliding seats, has been solved neatly and simply in the *Navion* through use of a sliding bubble canopy. This slides to the rear, after the design of the *Mustang*, thereby permitting passengers to step into their seats from the wing and eliminating the embarrassment of women passengers frequently noticed when entering or leaving other popular lightplane designs.

The four individual seats are fitted with innerspring seat cushions of *Airfoam* rubber. Each seat has an individual ash tray. The front seat floor is covered by a rubber

(*Turn to page 77*)

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2. Plastic Lewis Machine Guns (where required)
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floormat; the rear seat floor is carpeted. The luggage compartment is located behind the rear seats but well inside the cabin, another drawback of other designs. The compartment lid is lifted and up to 82 lbs. of baggage inserted and secured with tie-down straps. After closing, the lid serves as a shelf for hats, coats or small packages. The front seats are adjustable longitudinally. The right front seat and the rear seats are removable when the occasion demands. For example, 435 lbs. of cargo in a total area of 46 cu. ft. can be carried with such an arrangement. An infinite number of special arrangements can be made: the installation of photographic equipment for aerial survey work, small animal compartments, crop spraying chemical equipment, etc.

The instrument panel is attractively laid out and its provisions indicate the "cruiser" type of lightplane the *Navion* represents. Basic instruments in the rubber mounted panel are: an altimeter, airspeed indicator, tachometer, oil pressure gage, fuel pressure gage, magnetic compass, remote indicating fuel quantity gage, ammeter and oil temperature gage.

The *Navion* is powered by the new Continental six cylinder, horizontally-opposed, aircooled engine developing 185 hp. It is supported by a monocoque engine mount which is an integral part of the fuselage structure. Particular attention has been paid to ease of service and maintenance illustrated by the engine cowl which is mounted on two large hinges and swings open as in an automobile hood.

The electrical equipment includes a Delco-Remy starter, generator, 12 volt battery, position indicator for each of the landing gear wheels and a special warning light and horn which operate when the throttle is closed with the landing gear retracted. Complete navigation lights are carried. Although this is the basic model, provisions have been made for additional instruments, landing lights, flares, cockpit heating equipment and complete two-way radio equipment.

The *Navion* has a 33 ft. 4-9/16 in. wingspan. It is 27 ft. 4-13/16 in. long and stands 8 ft. 9 in. high. It weighs 1551 lbs. empty and can accommodate a gross weight of 2570 lbs. Although actual performance figures have not yet been verified, preliminary figures indicate a top speed of 160 mph and cruising speed at 70% power of 150 mph. With flaps extended 40% of full-down position, it lands at 54 mph and rolls only 605 ft. With 20% flaps it takes off in a distance of 695 ft. It climbs at 830 ft./min. after taking off at sea level. Its range, at 51% full power, is 700 miles. Fuel capacity is 40 gallons and 10 quarts of oil are carried.

As this is being written the *Navion* is undergoing CAA test flights and the data recorded from these tests will, of course, represent the official performance figures of the plane. Meanwhile, the first few demonstration planes are being assembled in preparation for various "announcement" parties to be held around the nation. North American is already hard at work assembling a sales and distributor system, something entirely new to a firm whose 12 year old sales office at Wright Field has been its only one.

Tooling has already been designed and much of it fabricated in anticipation of a 10-a-day production schedule, which shouldn't be too difficult for a firm who used to produce 25 *Mustang* fighter planes each day of the month!

The external appearance and perform-

(*Turn to page* 82)

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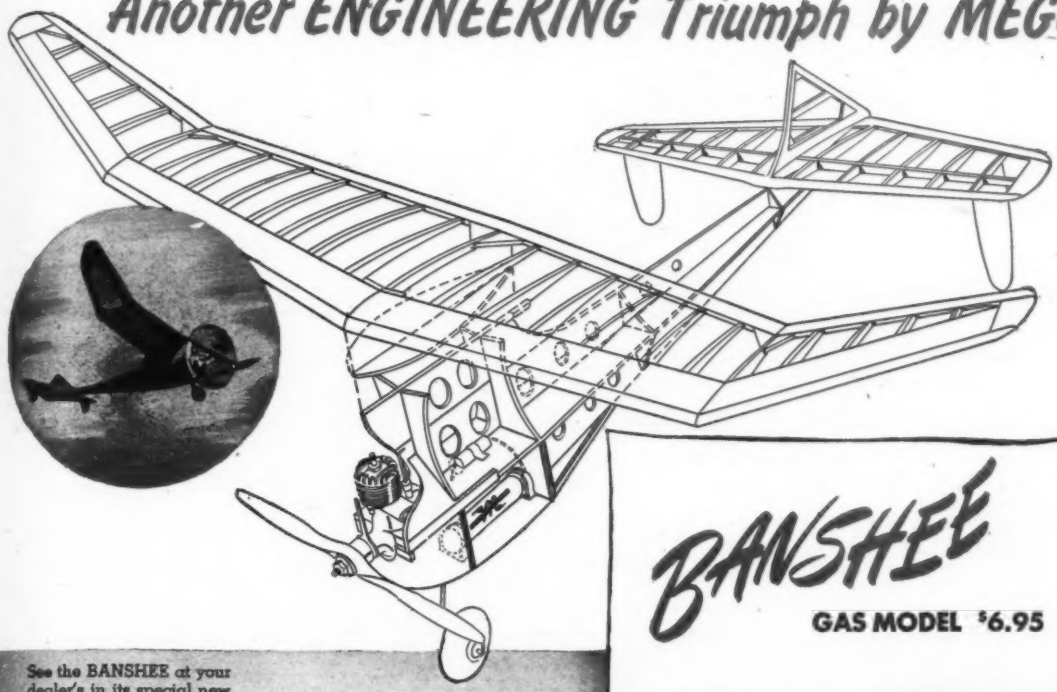

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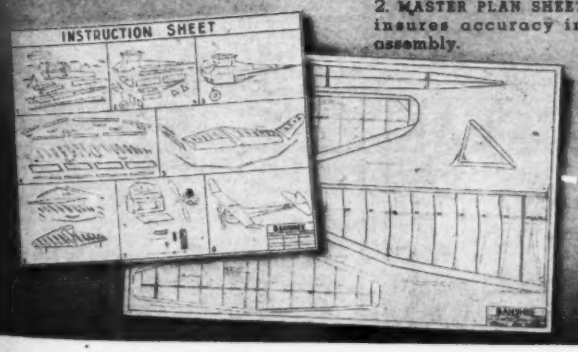


ance of a new lightplane is hardly the whole story and the operator will eventually grow far more interested in the economy and simplicity of maintenance. With all the speed of its design, NAA engineers were not too hurried to incorporate all the lessons of the *Mustang* into the *Navion*. The internal arrangement has been designed first for cleanliness, and second for roominess. For example, the radio equipment is located forward of the instrument panel; the battery is mounted aft of the cabin in the lower fuselage; the brakes are operated by a hand lever permitting simple rudder pedals replacing the complex swinging mechanical marvels of the military fighter; the exhaust manifold exits out underneath the fuselage and there is plenty of room between the instrument panel and the firewall for the technician to repair and/or replace an instrument or its system. The two 20 gallon fuel tanks are of pressed steel construction, thereby virtually eliminating leaks.

There have been few examples in recent years of major military aircraft manufacturers entering the personal aircraft field and it is a challenging prospect. But the North American *Navion* is a worthy entry into the race.

Mustang Fighter

(*Continued from page* 29)

has its own springy music wire gimmick to attach it to the wing frame, and further, that the gimmicks are glued firmly to the thickest part of the wing frame and touch the frame at no other spot. This means that shocks of landings and crashes into fences are absorbed by the music wire, instead of being transmitted to the wing by a solid joint. This sort of precaution adds months to the life of a model. A good pair of small-nosed pliers is required to do the wire bending; it's pretty much a cut and fit job. The wheel panels of 1/16" sheet balsa will be insured against splitting if you coat them with clear dope, then sand them smooth.

ASSEMBLY AND COVERING—All that's left now to finish the frame is to install the tail. Slit tail post and bulkhead J to admit the stabilizer in the position shown on the plan, and cement it in place. Cement the rudder in place. Then start covering the rest of the frame with tissue. You'll find it best to use small pieces where the curves are sharp. We covered the wing first and then the fuselage, being careful to get a good job at the wing root where we cemented the fuselage tissue to the wing tissue. Of course we had to be sure the wing tissue was firmly cemented in place too, and so we used cement to hold it at the innermost ribs, but clear dope everywhere else. By working a few ribs at a time you can be sure of getting the tissue properly attached to the important members, such as leading and trailing edge.

After covering, spray the model lightly with water to get rid of small wrinkles and let it dry. Trim the frayed ends that will appear here and there with sandpaper. If you like you can add a thin coat of clear dope, gaining strength and increasing weight slightly.

FLYING PROP—The flying prop is hard balsa; the harder the better. It is also low pitch. This is a fast flying model and the prop has to be able to take a head-on crash into anything. The prop rides on a hardwood bearing block and is spun by two strands of 1/8" flat rubber or equivalent.

FINISHING DETAILS—There are any number of details that can be added with

a pen and paint brush. The radio mast and tail wheel add realism, and if you want to keep your model on display when not flying her, you'll find a display prop and detachable wing tanks invaluable. Insignia and identification numbers can be painted on, and aileron, flap, rudder and elevator markings ruled on with India ink. And don't forget the black exhaust stacks up at the nose.

FLYING—Now comes the critical point. Will she fly? If you've cemented the frame together as carefully as we emphasized, have the landing gear properly attached, and a good strong prop, you can be pretty sure your ship will survive the initial adjustment period which is so fatal to many flying scale models. Try gliding and make crude adjustments, if needed, by adding weight to the nose or tail (modelling clay is O.K.). But most of the adjustments must be made under power, so after a couple of glides to familiarize yourself with the feel of the ship as it leaves your fingers, try about 20 turns on the motor. If she climbs, breathe on the stab and carefully bend the trailing edge down a little. If she still stalls, add weight to the nose. If your model dives, bend the stab trailing edge up until she flies level. For right or left spiral apply opposite rudder and carefully warp down the trailing edge of the inside wing. When she's set, give her full turns by hand, then a winder, and watch her go!

Just a few closing words about adjustments. The writer has seen model builders devote weeks to building a model and then because it didn't perform on the first five flights, retire it to a display piece and say it wasn't a good flyer. Any model, built strongly and without "goshawful" warping of the wing and tail, can be made to fly; it's just a matter of having the patience to live with it until you understand what's wrong and can correct it. That's why we believe in strong frames; they last through the adjustment period and you come out with a model that will perform for you on every flight. Contest models are something else again; but most flying scales are built for fun, and a strong model guarantees a good show.

Model Navion

(*Continued from page* 17)

between coats and in this way the weight will not increase excessively. The last coat should be rubbed down in order to get that fine finish that puts your ship out in front of the rest.

FLYING — The original model was powered by a *Merlin* engine swinging an 8" *Webber* prop of 10" pitch. This equipment proved highly satisfactory but any Class B engine should fill the bill.

Rather than offset rudder or motor to keep the wires tight, the ship was simply flown against torque, that is, with the prop turning in such a direction that the model tends to roll outward. The ship should be flown down wind to take off and to allow it to get off with plenty of speed. This gives you the control that is needed; but keep her close to the ground and you will keep out of trouble until you know the ship well enough to take her off and really kick up the dust.

XB-42 MINUTE MODEL

ANOTHER of the tiny models by Herb Weiss will appear in our August issue. This one features the radical MIX-MASTER bomber—and though the wingspan is only 11" the model holds enough rubber for good flights.

Precision Weighing On a Parcel Post Scale

by RAY RUSHER

IN WORKING with model airplanes it is often desirable to weigh certain parts with accuracy down to half a hundredth-of-an-ounce. A parcel post scale of the 1 to 4 lb. type illustrated in the drawing is ideal for this purpose if a little work is done on it to make it more sensitive, and a set of fill-in weights is provided.

Start by removing the screws that hold the housing cover in position and those that hold the lower linkage to the bottom of the scale base. This permits the assembly of pan, beam, yoke and lower linkage to be lifted out of the housing as a unit so that access can be had to the knife edges, knife-edge seats, pivot pins and pivot holes. Polish the knife edges and the knife-edge seats with fine emery paper, No. 600 or 700, and finish with emery polishing paper and light machine oil. The papers should be glued to flat blocks of wood having beveled edges. Polishing should be done mainly on the surfaces of contact between the knife edges and the knife-edge seats, which surfaces are adjacent the apices of the edges and the bottoms of the seats. All rust especially should be polished away (see detail A).

The lower linkage pivots are not as important but nevertheless should be polished. This is done by soaking a thread in light machine oil and fine abrasive such as emery or carborundum flour; loop the thread around the pivot pin and work it back and forth while holding it taut by grasping its ends. The pivot holes are similarly polished (see detail B).

After the polishing operations, remove all traces of abrasive and cuttings by washing all pivots with naphtha or gasoline. Clean all dust out of the housing and its cover. Wipe the pivots with a soft lintless cloth dampened with sewing machine or 3-in-1 oil, making sure only a very thin film of oil is left on the surfaces, and reassemble the scale.

If the polishing and oiling jobs have been properly done, the sensitivity will now be such that the beam will continually swing up and down when the scale is balanced at zero. This is due to air currents in the room. A¼" square of ordinary writing paper will cause a noticeable movement of the beam pointer. Sensitivity will be maintained for a period of 3 or 4 years before the pivots require slight touching up and reoiling.

Set the scale by means of the adjusting screw in outer end of the beam so that the pointer is on the zero mark of the frame when the beam weight is at zero notch of the beam. To stabilize the beam during this operation, and while subsequently using the scale for precision weighing, a dash-pot can be installed. This eliminates the necessity of using the laboratory method of taking several readings while the beam is swinging and then averaging the readings.

The dash-pot consists of a bottle of light machine oil, a tin disk piston. A stem soldered to the piston should have a hole in its upper end to slip onto a piano wire that is soldered in holes drilled in the beam adjacent its outer end. The hole in the stem should be no more than .001" larger than the wire to prevent lost motion and yet eliminate all binding. Use the adjusting screw to compensate for the weight of the wire. Keep the bottle

capped when not in use to prevent the oil from changing in viscosity.

The weight of the disk and stem must be compensated for; this is best done by adding weight to the pan *(while the disk is submerged in oil)* until a zero reading is had with the beam weight at zero. The added weight may be a length of solder and should be kept with the dash-pot when the latter is not in use. The reason for having the disk submerged when determining the proper added weight is that the disk will have a different weight in oil than in air.

Now weigh out 1 lb. of solder (approx. 20 ft.), the kind that is about ⅛" in diameter and solid—not acid or rosin core. Of course the solder should be of uniform crossection, but most solders will be found to possess this quality. When you have weighed out exactly 1 lb., measure its total length and divide by 16. This gives the length of a piece of solder weighing 1 oz. (about 15"). Cut a piece this length by means of a knife blade, rolling the solder under it. This insures against any of the solder being cut away as would be the case were a saw used.

Place the 1 oz. length of solder on the pan of the scale. Set the beam weight at the 1 oz. notch and see if the pointer on the outer end of the beam registers with the zero mark of the scale frame. If slightly off, carefully file the 1 oz. notch so as to position the weight farther out if the pointer is above zero, or farther in if the pointer is below (see detail C). Thus the pointer can be made to register with the zero mark when there is a 1 oz. weight on the pan.

Cut the ounce length of solder into 6 pieces to serve as fill-in weight, their respective weights being as follows:

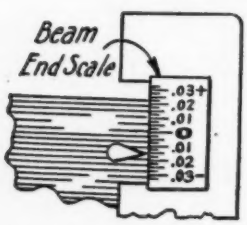
.300 oz. .200 oz. .100 oz.
.200 oz. .150 oz. .050 oz.

and then cut another piece of .025 oz., using a ruler to measure the pieces rather than weighing them. For instance, if 1 oz. of solder measures 15 5/32", then .200 oz. would measure 3 1/32". With these fill-in weights an object of less than 1 oz. can be weighed by placing on the pan with the object enough fill-in weights to bring the pointer to the zero mark on the frame. Then by subtracting the total weight of the fill-ins from 1 oz. the weight of the object is determined within .025 oz. (the smallest fill-in).

To determine weights that fall between .025 oz. units, a beam end scale is added to the scale frame. This may consist of a strip of paper on which .005 oz. graduations are inked, the paper being held on with scotch tape. To determine the positions for the graduations, place .975 oz. of fill-in weights on the pan while the beam weight is in the 1 oz. notch and measure the distance from zero mark down to the pointer. Do the same with 1.025 oz. (all the fill-in weights) on the pan measuring the distance from zero up to the pointer. These two distances should be the same if 1 oz. of fill-in weights causes the pointer to exactly register with the zero mark. Lay off the total of the two distances on the beam end scale and divide into 10 equal parts. Each part will represent .005 (½ of 1/100) of an ounce. The graduations can be extended to about .030 if desired.

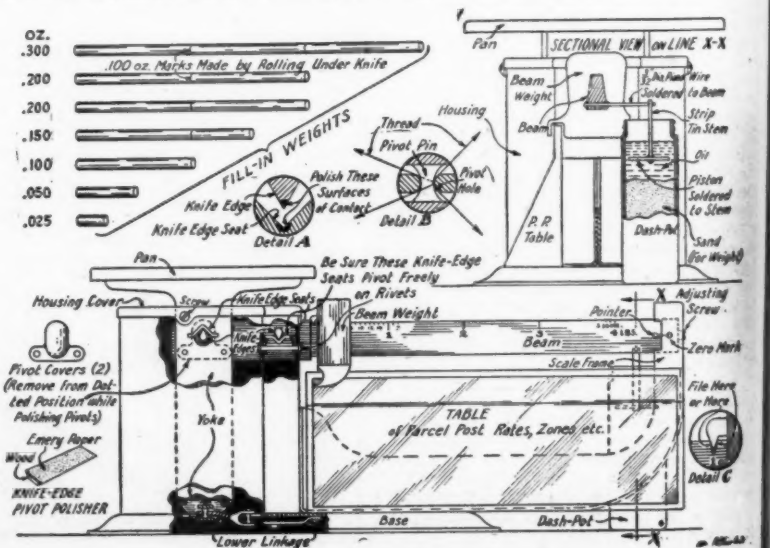
Now, when an object is weighed together with the proper fill-in weights to make up approximately 1 oz., any deviation of the pointer from zero will require adding the indicated number of graduations on the beam end scale to the determined weight of the object if the pointer is above the zero mark, or subtracting if it is below. For example:

add fill-in weights:	.300
	.200
	.025
Total	.525
subtract graduations	.015—(see pointer
=	.510 position above)



The object in this case weighs 1 oz. minus .510 or .490 oz. The results are thus accurate down to ½ of 1/100 of an oz. or even less if you make the graduations as fine as illustrated above, which are ¼ of 1/100 of an oz.

While directions have been given for treating the 1 oz. notch of the scale beam, the 2 oz. notch and so on may be similarly treated if you wish to weigh objects over 1 oz. in weight. Additional 1 oz. lengths of solder are used to determine whether the notches should be filed or not, and if so on which side. The one set of 7 fill-in weights is all that is necessary for weighing any object, the fill-in weights of course being usable with the beam weight set at any oz. notch of the beam. The .300 oz. weight and one of the .200 oz. weights can be dispensed with if you treat the ½ oz. notches in the same manner as the 1 oz. notches.



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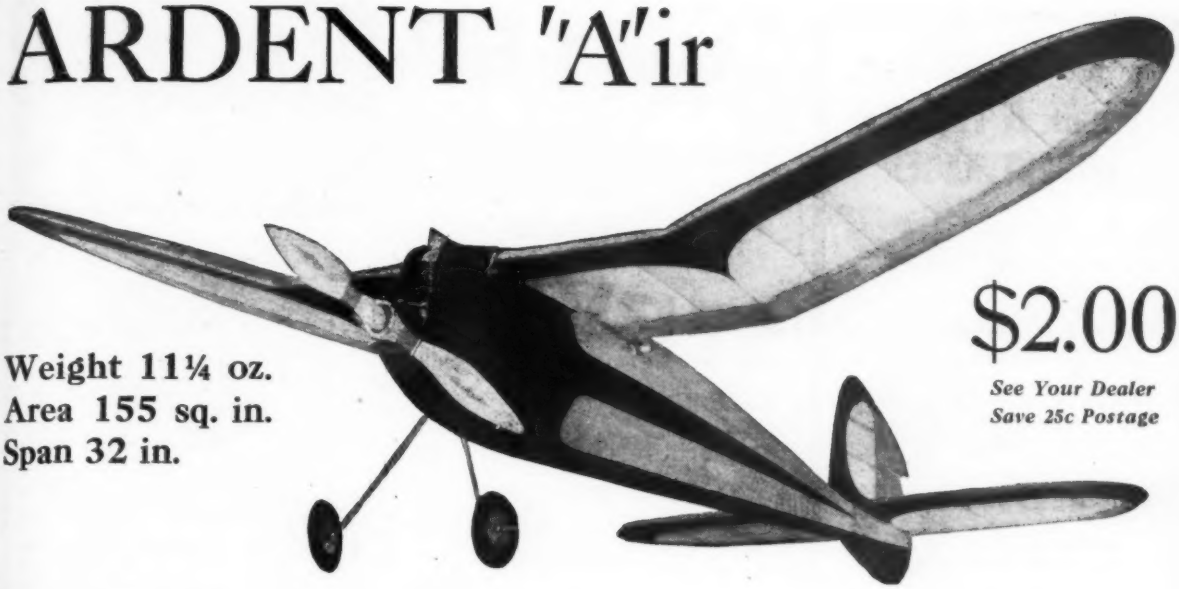

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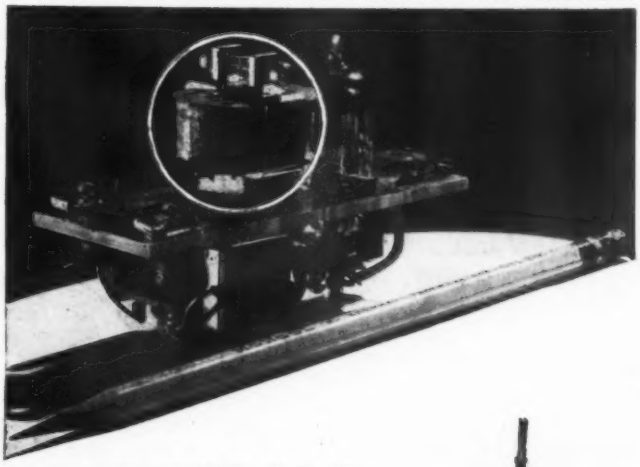

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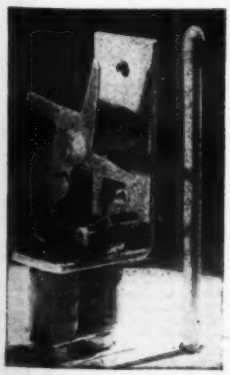

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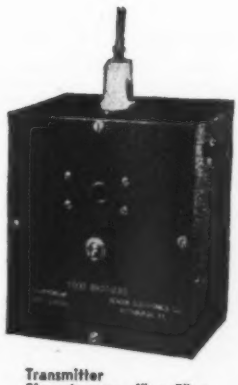

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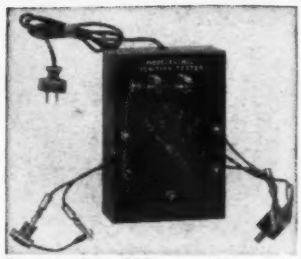

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R. C. Escapements

(*Continued from page 33*)

the armature bracket but should not be too loose endways.

Next, the escapement arms (5A, 5B) are cut from .033 brass to the size shown in the drawing. It is important that the length of each arm from the center hole be the same. Escapement arm 5A can only be used with armature 3A, which is for the standard unit.

The shaft with the crank throw (6) is next bent from .030 music wire. The hook for the rubber is bent after assembly. Next, the control arm (7) is bent from .030 music wire, or heavier if desired. The slot in the arm is to fit the crank throw on the shaft and should be .030" wide. Too tight a fit will prevent smooth operation and cause binding; on the other hand a slot too wide will allow the control arm to wobble back and forth with a resulting play in the rudder or elevator movement. The armature spring (8) is made by *tightly* winding six turns of .010 music wire around a 1/16" diameter rod. Leave about 1-1/4" on each end of the spring to allow for shaping and cutting to size.

This leaves only the coil to be constructed before assembling the unit. The coil core (9) is either turned from soft iron and tapped for a 2-56 machine screw at the bottom or filed down from a 1/8" soft iron rivet about 1/2" long. The shank of the core piece is 1/8" diameter with a cap on the top 1/4" diameter and 1/32" thick. The shank is 1/2" long for a turned piece and slightly longer if made from a rivet (to allow for thickness of mounting piece and riveting). If a rivet is filed down, a shoulder will have to be filed around the bottom to fit the mounting hole on the base. It should be drilled out slightly and extend through the hole about 1/64" so it may be riveted.

Next cut two washers from 1/32" fibre according to the drawing. A small hole is drilled in the bottom washer as shown to allow the end of the inner layer of wire to be drawn through. Both washers should be a tight fit on the shank of the core piece. Slide them on the core and give the assembly two coats of clear nail lacquer or dope. When dry, wind 6 layers of No. 26 enameled copper wire on the core, allowing about 2" of wire from the bottom layer to protrude through the washer hole. A thin coat of dope should be applied as a means of insulation between each layer of windings. Make the winding neat, close together and flat. Give the completed coil two coats of clear nail lacquer or dope, the lacquer being preferred in all cases.

Now for the final assembly. Scrape the enamel insulation from the wire protruding from the winding and make one loop around the bottom of the shank on the coil. Secure the coil to the mounting piece with a 2-56 machine screw or by riveting it, with the loop of wire making good contact with the base. The base is used as one side of the electrical connection to the coil.

Slip the spring over the tubing on the armature with the upper end bent, as shown, around the top armature arm. The short end of the spring is hooked over a notch cut on the side of the armature bracket. The assembly is fastened with a piece of music wire as an axle through the bracket and tubing. The spring should push the armature away from the top of the coil. Make sure the armature is inside the stop on the base; the top of this stop may have to be filed down so that it fits the cut out space on the coil end of the armature arm.

The shaft is next soldered in position on the escapement arm as shown. Several washers are slipped on the shaft before it is put in place. Enough washers are needed to bring the escapement arms in the center of the armature tabs. A hook for the rubber is bent and a small washer is soldered in place to prevent the shaft moving forward. The control arm is next put in position with the crank throw on the escapement arms going through the slot in the control arm. A small washer soldered on the end protruding on the back of the base will prevent it from coming out.

We're now ready for the final adjustment, which is accomplished in the following steps: 1. The armature should be forced away by spring pressure from the top of the winding, but motion should be limited by the armature stop on the base. 2. The armature stop is bent so as to hold the armature about 3/64" away from the top of the core. 3. The escapement arms should be held by the bottom tab on the armature by about 1/32" when they are rotated and the armature is in a normal position (away from top of the coil). A slight amount of filing may be necessary. 4. When the armature is depressed against the top of the coil, the arms should clear the top of the tab by about .005". 5. With the armature in normal position the escapement arms should miss the upper tab by about .005" but should stop them by about 1/32" when it is depressed. A slight amount of bending on the upper arm of the armature will give the desired results.

One loop of 1/8" flat rubber about 12-14" long is attached to the hook on the shaft and anchored in the plane or on the board being used for test purposes. About 125 turns, wound so the escapement arms turn in a clockwise direction, is sufficient to power the unit for any normal flight. The coil was designed to operate from one penlight cell. It is suggested that the power for operating this unit be obtained from the same source as the ignition and that a small storage battery of two volts be used. Three volts should be used if more rubber is employed to obtain more power from the control arm.

It has been found that an elevator or rudder area of 5-15% of total horizontal or vertical surface is sufficient for good control, with 8% being an optimum value. A trailing edge movement of approximately 1/8" is also suggested. These values depend of course on the type of plane, its characteristics and speed. Too much rudder area or movement will throw the plane into an uncontrollable spin. The amount of movement depends on the position in which the control cable is attached to the control arm and the length of the control horn on elevator or rudder.

The double escapement makes a compact arrangement for two channel control and is built in the same manner as the single unit except that the escapement arms and movement are reversed on one side. Besides being lightweight and small in size, these escapements are inexpensive and do not necessitate complicated receivers or other control components, thus making them adaptable for the beginner as well as the advanced builder.

Flash

(*Continued from page 2*)

Boeing's Seattle plant.

PUTTING THE quietus on recent published proposals, Dr. Arthur H. Compton, renowned scientist and atom bomb expert, states that "atomic power units for airplanes will never be practical because such units will never weigh less than 100 tons."

AMERICAN AIRLINES engineers state the Consolidated-Vultee Model 240 transports ordered by them will be fitted with pressure cabins. The 100 twin engine transports on order will be equipped to maintain sea level atmosphere at 7,000 ft. Unit price of the new version is $242,000 as compared with $180,000 in the original model. Pressurization will up operating costs from 4c to 5c per mile.

POSTWAR REORGANIZATION of AAF by its new Commanding General Carl Spaatz has at last been announced, putting an end to much speculation. The combat commands will be composed of: (1) Strategic Air Command, the long range striking force; (2) Air Defense Command, the home force; (3) Tactical Air Command, the cooperating force with ground and sea forces of the Army and Navy. Supporting services will include: (1) Air Material Command, performing research, maintenance and supply; (2) Training Command, which will only train at the individual level, unit training being the responsibility of the combat commands; (3) Air Transport Command, maintaining a global system of air transportation, communications, weather, rescue, flying safety and air charts and maps; (4) Air University, a sky-side Command and General Staff School; (5) Air Force Proving Ground Command, to create and develop new tactical methods, equipment and techniques. The future importance of research and development, so thoroughly proved in the war, is assured with the creation of a Deputy Chief of Air Staff whose sole duty it is to push research into new weapons and techniques. Maj. Gen. Curtis E. LeMay has been appointed to this important assignment.

WHAT MAY PROVE eventually to be an item of considerable importance is the reworking of long range fuel tanks on the Lockheed *Lodestar* belonging to Jacqueline Cochran. The work is being done at the Lockheed plant and will give the giant craft a 3,000 mile range.

THAT THE AAF is not overlooking any strategic bets is evidenced from the fact that between 40 and 50 B-29 *Superforts*, two squadrons of fighter craft, possibly jet propelled, and 5,000 officers and enlisted men will be based permanently at Kindley Field. Where is Kindley Field? In Bermuda, 800 miles out in the Atlantic!

AFTER TEN YEARS and several hundred thousand dollars worth of airplanes, one has finally been landed by parachute! The feat was performed with a Taylorcraft near New Brunswick, N. J. by Gerard Bruder. The chute was opened at 6,000 ft. but as Bruder and plane swayed past the 2,000 ft. mark the latter took to his own chute! But he insists the plane landed with a force "just about equal to a normal landing." The chute was developed by A. J. Steinthal who states he has no immediate plans to market it.

THE WIDELY argued cost of a Boeing *Stratocruiser* has at last been settled by the statement of H. R. Harris, v.p. of

(*Turn to page 93*)

American Overseas Airlines, who purchased 8 of them: $1,300,000.00 *each!*

A SURE SIGN that peace is here is the recent dispute between AAF officers and the Calif. Dept. of Public Works. It seems the AAF was all set to move the new Douglas XB-43 turbo-jet bomber from the Santa Monica plant to the Army's testing base at Muroc when the CDPA said: "No!" The huge trucks finally rolled only after angry wires had flashed between the Pentagon and Sacramento. But that established no precedent so far as the Californians were concerned. The AAF had the new Hughes photo-reconnaissance job ready to roll when CDPA again shouted: "No!" One can well imagine the outcome of such a debate one year ago!

AUSTRALIA HAS test flown its first four engine airplane, an Avro *Lincoln* bomber. It is the first of 61 under construction for the Royal Australian Air Force. The *Lincoln* is the first production bomber to be fitted with a twin 20 mm power driven cannon turret.

HIS MANY FANS will be happy to learn that *Mr.* Jimmy Doolittle has taken delivery of his postwar personal plane in which he will transact his duties as Vice President of Shell Oil Co. The plane? A North American B-25 *Mitchell*, his mount on the historic Tokyo ride! His first trip was a 10,000 mile hop through South America.

OLDTIME BOEING employees smiled nostalgically recently as they looked down the assembly line at a big-as-life Model 247, world's first "180 mph transport." The twin engine transport, with 16,000 hrs. under its belt, is in for a face-lifting after which it will take up right where it left off. Built in 1933, the still sleek monoplane belongs to Wien Alaska Airlines and is getting four additional wing tanks, latest direction finding equipment, and a 1946 Boeing-designed paint job. After all, what's 13 years in a 247's life?

AS THOUGH IT didn't have enough to keep it busy, the State Department announced it intends to create the new office of Asst. Secy. of State for Air. Detailed duties of this new office are wholly conjectural at this stage.

THE NAVY DEPARTMENT announced that Douglas Aircraft is now building a supersonic aircraft but all details beyond this bare statement are classified.

FOLLOWING PREDICTION made in these columns, a commercial model of the G & A XR-9 helicopter has been announced by Firestone Tire & Rubber Co., parent firm. The new model will cruise at 80 mph, climb 1000 fpm and have a service ceiling of 10,000 ft. Its fuel capacity of 25 gallons is adequate for 3 hrs. flying. It has a 28 ft. rotor and is powered by a 135 hp Lycoming four cylinder engine. Principal difference over AAF version is an enlarged cabin with upholstery and stylized controls and instrument panel.

WAR ASSETS CORP., present executive agency for surplus war materiel, reports to date a total of 20,474 surplus aircraft have been sold or leased. This leasing is based on previous practice as it has now been discontinued. An index to transport popularity may be gained from the fact that of 964 DC-3's declared surplus, 454 have been sold or leased; of 349 DC-4's offered, 142 have been disposed of; of 678 Curtiss *Commando's*, 11 have found new owners.

THREE B-29 *Superforts* are scheduled to make *Loran*-guided experimental flights over the North Pole, according to

a report from Edmonton, Ont. Loran stations are being established in Alberta and other northern points for the purpose. The strategic implications of these experiments are startlingly clear but following their completion the planes, crews and equipment will be shifted to the South Pole!

A SOLUTION TO the vexatious problem of long takeoff runs by turbo-jet aircraft looms in the report of tests on a JATO-equipped P-80 *Shooting Star*. First significant revelation of the report was the fact that a P-80 requires 2,960 ft. to execute a normal take-off, clear index to the major weakness of turbo-jet installations in military interceptors. With two 2,000 lb. static thrust JATO units installed, the P-80 got off in 1185 ft., about 40% of the normal distance! The units weigh only 200 lbs. each and may be dropped after their 12-15 sec. burning of solid rocket fuel. But further improvements are going to be needed to get a turbo-jet fighter off the 500 ft. or less deck space available on an aircraft carrier!

FIRST TEST FLIGHTS of the new Hockaday *Comet* 2-place lightplane were declared successful. The new model has been "cleaned up" and is now undergoing CAA certification tests. N. R. Hockaday, company president, says the *Comet* will not be placed in production until late fall.

EVIDENCE THAT the lightplane manufacturing industry wasted little time in getting away to a flying start after firing of the V-J Day gun comes in the first official report of lightplane production during 1945. A total of 1,945 (believe it or not) commercial planes in the 2, 3, 4-place category was completed during the year. Production is now hovering towards the 2,000/month rate but the industry will have to accelerate rapidly to complete its expected 30,000 this year.

THE SEE-SAW battle over the top secret question: "How much does an atomic bomb weigh?" recently "see-ed" to the bottom of the scale when it was declared that it would fit in a good-size suitcase. Now it has "saw-ed" towards the other extreme with the statement by Maj. Gen. Leslie R. Groves, Manhattan Project director, that only the B-29 can carry an atomic bomb!

THAT AIR RACING is back again in all its glory is borne out by the formation of International Air Race Corp., for the purpose of sponsoring a round-the-world dash for $250,000 in prize money. That this is no ballyhoo company is indicated in the appointment of Col. Bennett H. Griffin, early trans-Atlantic flier, as president and Lt. Comdr. Barney Capehart, National Air Races prewar announcer, and two others. All are now civilians. Preliminary plans point to Washington, D. C. as takeoff and finish point.

THE U. S. DOESN'T intend to allow Great Britain permanent ownership of the world's landplane speed record. Unofficial AAF speed tests on the Lockheed P-80 have been conducted at Muroc, Calif. over the past few weeks in preparation for an officially witnessed and publicized attack this summer. Although the new Republic XP-84 *Thunderjet* promises greater speed than the P-80, AAF engineers point out that the streamlined new fighter has made only a few preliminary test flights and that a considerable amount of developmental test work is still required before it develops its maximum potentialities. The P-80, on the other hand is a well seasoned veteran and has been thoroughly "broken in" in its 18 months of service.

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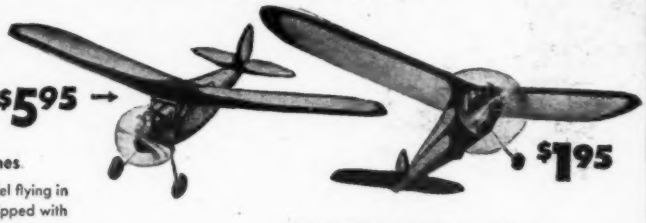

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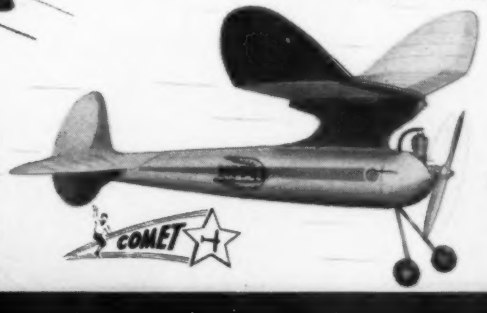

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